

CORRES. CONTROL  
OUTGOING LTR NO.DOE ORDER #  
05-RF-00934

DIST.	LTR	ENC
FERRERA, D.W.	X	X
GIACOMINI, J. J.	X	
GILPIN, H.E.	X	
LINDSAY, D. C.	X	
LONG, J. W.	X	
CROCKETT, G.	X	X
SHELTON, D.C.	X	X
TUOR, N.R.	X	

October 11, 2005

05-RF-00934

Charles A. Dan, Jr.  
Contracting Officer  
DOE, RFPOKAISER-HILL RESPONSE TO FINAL PUNCH LIST ITEMS FOR SURFACE WATER AND  
WETLANDS - GAC-108-05Ref: Charles A. Dan, Jr. ltr. (00555) to Gregg Crockett, Final Punch List Items for  
Surface Water and Wetlands, September 19, 2005

Please find enclosed Kaiser-Hill Company's responses to the Final Punch List Items for Surface Water and Wetlands, consistent with Section 7.6 of the Omnibus Agreement. In accordance with the Omnibus Agreement, each of the issues identified in the subject letter has been addressed, as indicated. Enclosed with this transmittal are also included:

1. Pond C-2 engineering as built drawings,
2. Pond Operations and Maintenance (O&M) Manual, which is for the A, B and C series ponds, and
3. Modified Pond B-5 engineering as built drawings reflecting the work that was completed (other B-5 drawings remain unchanged).

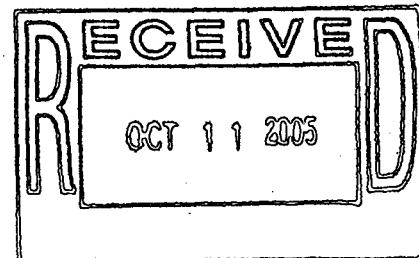
Additionally, submittal of the C-2 engineering analysis completes the requirements of Section 4.4 of the Omnibus Agreement. Please contact David Shelton at 303-966-9877 if you have any questions or you need additional information.

Sincerely,

 A handwritten signature of Gregg Crockett in black ink.
 

Gregg Crockett  
Director of Administration and  
Chief Financial Officer

DCS:plh

Enclosures  
As Statedcc:  
Frazer Lockhart - DOE, RFPO  
John Rampe - DOE, RFPO

ADMIN RECORD

COR. CONTROL X X  
ADMN. RECORD X X  
WASTE REC.  
TRAFFIC  
PATS/130CLASSIFICATION  
ICNI  
UNCLASSIFIED  
CONFIDENTIAL  
SECRETAUTHORIZED  
CLASSIFIERDate  
IN REPLY TO RFP CC  
NO:  
N/A

## ACTION ITEM STATUS

- ☐ PARTIAL/OPEN  
☐ CLOSED

## LTR APPROVALS:

ORIG & TYPIST  
INITIALS  
DCS/plh

Kaiser-Hill Company, LLC  
Rocky Flats Environmental Technology Site, 12101 Airport Way, Unit B, Broomfield, CO 80021-2583 • 303-966-7000

SW-A-005169

**Responses to Final Punch List Items for Surface Water and Wetlands**  
**(Letter # RFCPM:JJR:05-00555)**

- 1) Complete outlet work reconstruction at Pond C-2. Provide documentation of completion to RFPO, including as-built drawings and recommended operation and maintenance procedures.

The upstream outlet gate was successfully replaced on September 13, 2005 and passed hydrostatic testing on September 14, 2005. Attached are the as-built drawings, and the commensurate operation and maintenance (O&M) manual. The O&M manual provided is for the ponds in all the drainages.

- 2) Complete outlet work repairs at Pond B-5. Provide documentation of completion to RFPO, including as-built drawings and recommended operation and maintenance procedures.

The upstream gate valve was replaced on August 25, 2005. Please find attached the as-built drawings for the repairs done on Pond B-5. Only pages 7, 8, and 10 were modified from the originals.

- 3) Complete dam maintenance items identified in the August 10, 2005, inspection by the Federal Energy Regulatory Commission (FERC), as documented in the FERC letter dated August 23, 2005.

The dam maintenance item identified by FERC was for herbicide control of the upstream sides of the dams. This work was accomplished on September 19, 2005 using brand name herbicide RODEO.

- 4) Provide documentation to RFPO that the pond outlet works and bypasses are operable, consistent with Attachment A-4 of the *Omnibus* Agreement.

All valves associated with pond outlet works and bypasses, consistent with Attachment 4 of the *Omnibus* Agreement, have been cycled and verified operable within the past 12 months. Cycling of these valves is consistent with the State of Colorado Division of Water Resources requirements.

- 5) Perform final grading and culvert removal at the juncture of Functional Channel (FC) 1 and North Walnut Creek to minimize future erosion and maximize (to the extent practicable) wetland growth in the area.\*

Kaiser-Hill completed this effort on September 23, 2005.

- 6) Cut back steep slopes noted between B371 and former B771, and fill in borrow area noted between B371 and former B771 near south bank of North Walnut Creek.\*

This will be done and reviewed for acceptance during closure of Sector 5A.

**Responses to Final Punch List Items for Surface Water and Wetlands (continued)**  
**(Letter # RFCPM:JJR:05-00555)**

- 7) Repair/ re-grade areas of gulying on south bank of North Walnut Creek west of surface water monitoring station SW093.\*

This has been done and accepted during closure of Sector 2B.

- 8) Modify the area at the manhole that accesses the collection sump at the Mound treatment system to assure access and prevent the manhole cover from being in a closed depression.\*

This has been done and accepted during closure of Sector 6A.

- 9) Repair gullies on southeast side of rip-rapped portion of FC 5, and place erosion controls as needed per Site erosion control procedures.\*

This has been done and accepted during closure of Sector 6B.

- 10) Remove/disable (as appropriate) storm drain along Central Avenue, and remove associated utilities such as gas line.\*

This has been done and accepted during closure of Sector 10D on September 20, 2005.

- 11) Perform an additional sampling of Wells 20205, 20505 and 20705 for total and filtered plutonium and americium (assuming wells have water sufficient for sampling).

Sampling conducted on September 7, 2005. Results reviewed by RFPO on September 28, 2005.

- 12) Perform a sampling of SW056 for VOC content of the seep water.

Sampling was conducted on August 30, 2005, and complete results received on September 13, 2005. Results reviewed with RFPO on September 14, 2005.

Items marked \* may be verified through the sector closure activities that will be performed by RFPO. Items relating to the adequacy of re-vegetation will also be closed by RFPO through the sector closure process for those sectors not already closed and approved by RFPO.

UNITED STATES DEPARTMENT OF ENERGY  
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE  
WATER DIVISION 1, FORMER WATER DISTRICT 2  
C-2 DAM OUTLET MODIFICATIONS

DRAWING INDEX

DRAWING NO.	DRAWING TITLE
51420-0051	TITLE SHEET AND DRAWING INDEX
51420-0052	SITE MAP, ABBREVIATIONS, AND CONSTRUCTION ACCESS
51420-0053	GENERAL SITE PLAN
51420-0054	DETAILS
51420-0055	STRUCTURAL PLANS AND DETAILS
51420-0056	RESERVOIR AND OUTLET WORKS TABLES AND CURVES

ITEM NO.	QUANTITY	DESCRIPTION	MATERIAL
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CERTIFICATION

I hereby certify that these plans for the construction of C-2 Dam Outlet Modifications were prepared under my direct supervision for the owner thereof.

James R. Schneider, P.E. No. 25293

Date

AS-CONSTRUCTED CERTIFICATION

These plans represent the AS-CONSTRUCTED conditions of the C-2 Dam Outlet Modifications to the best of my knowledge and judgement, based in part on information furnished by others as of the \_\_\_\_ day of \_\_\_\_.

Date

RECORD DRAWINGS

Revisions Drawn By C. SCHNEE Date SEPT 2005

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

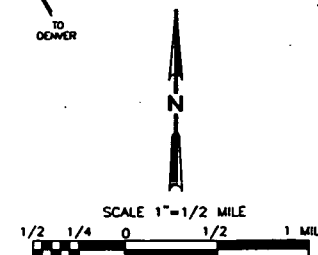
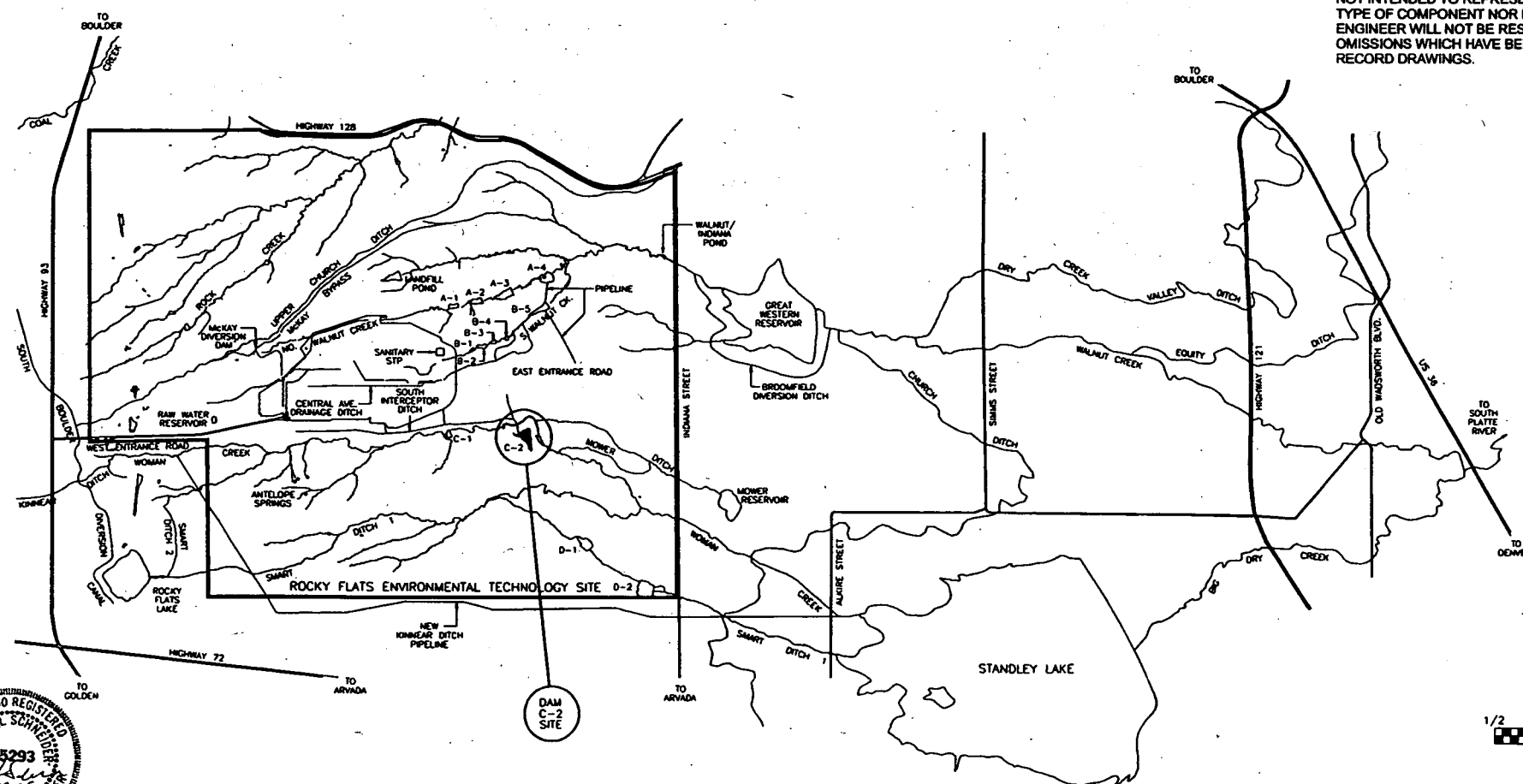
Approved on the \_\_\_\_ day of \_\_\_\_.

State Engineer

by

Deputy

State Engineers Office Number: DAMID: 025628

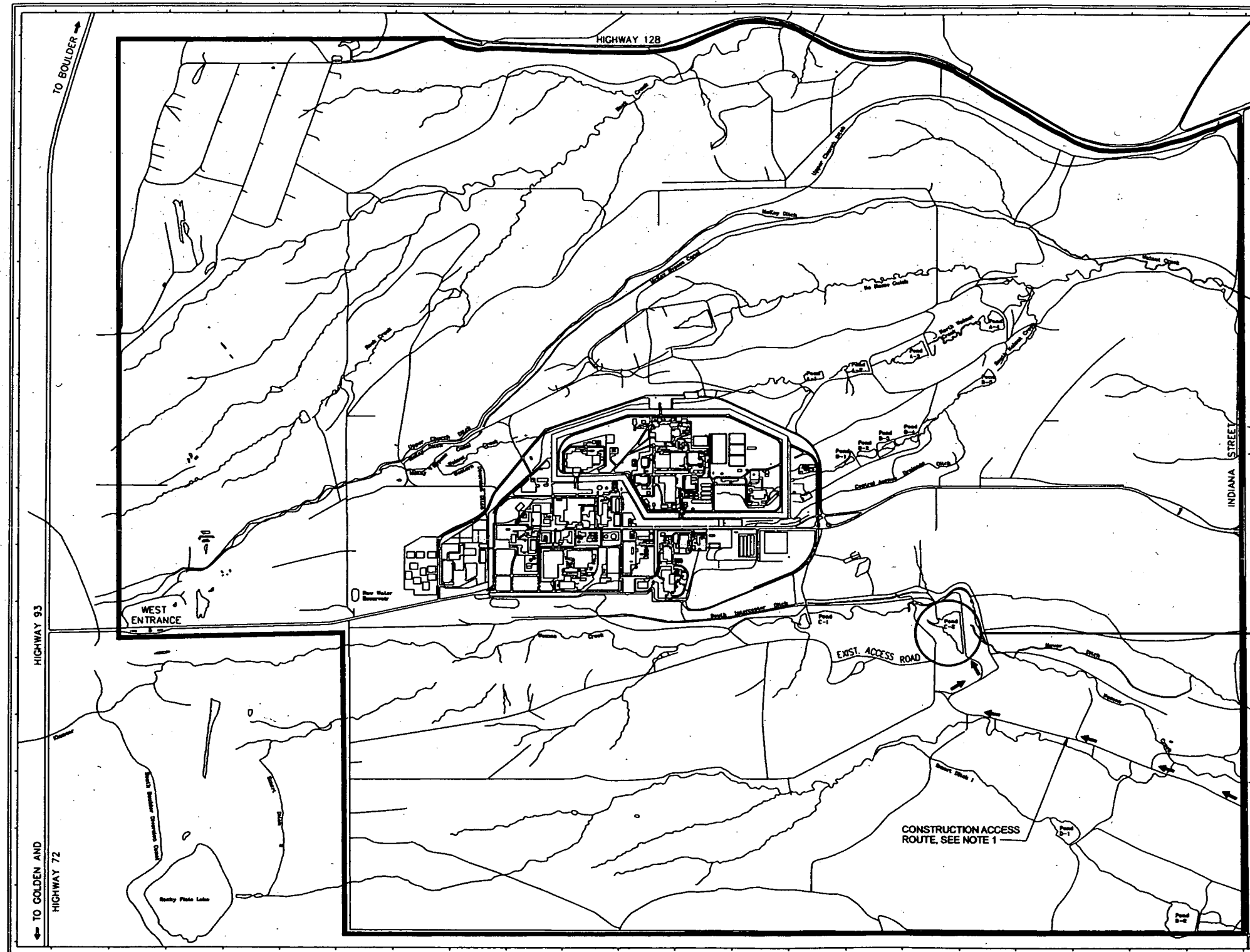


CH2MHILL

C-1546A

RECORD DRAWINGS									
ISSUE	CH2MHILL, INC. DESIGN COMPANY	9-19-05	PDT	CMS	JRS	REK	JRS	APVD	EBB42148
KEYWORDS	DESIGNED BY: P. TSCHESCHKE	6-10-05	U.S. DEPARTMENT OF ENERGY ROCKY FLATS OFFICE GOLDEN, COLORADO						
1. ANGLE	DRAWN BY: S. NORVILLE	6-10-05	Rocky Flats Environmental Technology Site						
2. DEC.	DRAWN BY: J. SCHNEIDER	6-10-05	C-2 DAM OUTLET MODIFICATIONS						
3. UNLESS NOTED OTHERWISE	APPROVED BY: R. RIKER	6-10-05	TITLE SHEET AND DRAWING INDEX						
4. REMOVE BURRS AND SHARP EDGES	APPROVED BY: J. SCHNEIDER	6-10-05	DRAWING NUMBER						
5. BLOCK/ASSEMBLY SITE	CEX-105-01	ADDITIONAL APPROVALS	ISSUE						
6. BLOCK/ASSEMBLY SITE	CEX-105-01	ADDITIONAL APPROVALS	SHEET						
7. BLOCK/ASSEMBLY SITE	CEX-105-01	ADDITIONAL APPROVALS	1 of 6						





ITEM NO.	QUANTITY	DESCRIPTION	MATERIAL
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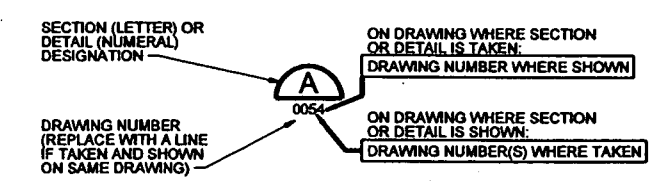
ABBREVIATIONS

BM	BENCHMARK
CL	CENTER LINE
CLR	CLEAR
CONC	CONCRETE
CP	CONTROL POINT
CTR	CENTERED
DIA	DIAMETER
DWG	DRAWING
E	EAST
EA	EACH
EL	EACH FACE
EL	ELEVATION
EW	EACH WAY
EXIST	EXISTING
FT	FEET
GALV	GALVANIZED
H	HORIZONTAL
HAS	HEADED ANCHOR STUD
IN	INCHES
INV	INVERT
MAX	MAXIMUM
MIN	MINIMUM
N	NORTH
NTS	NOT TO SCALE
OC	ON CENTER
PL	PLATE
RCP	REINFORCED CONCRETE PIPE
RCCP	REINFORCED CONCRETE CYLINDER PIPE
REINF	REINFORCING
S	SLOPE
SCH	SCHEDULE
SQ	SQUARE
TOPO	TOPOGRAPHY
TYP	TYPICAL
V	VERTICAL
W	WITH
WWTP	WASTE WATER TREATMENT PLANT

GENERAL NOTES FOR DRAWINGS SHOWING EXISTING AND NEW FEATURES

1. EXISTING FEATURES (BEFORE THE START OF CONSTRUCTION) ARE SHOWN LIGHT-LINED AND/OR SCREENED, AND ARE NOTED AS EXISTING OR PREVIOUS. NEW FEATURES ARE SHOWN HEAVY-LINED.

DRAWING IDENTIFICATION SYSTEM



DRAWING NUMBER REFERENCES BETWEEN DRAWINGS AND DETAILS USE THE LAST FOUR DIGITS OF 9-DIGIT DRAWING NUMBERS.

RECORD DRAWINGS

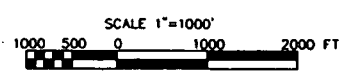
Revisions Drawn By C. SCHNEE Date SEPT 2005

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C-1546A

NOTE:

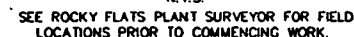
1. CONSTRUCTION SUBCONTRACTOR SHALL VERIFY CONSTRUCTION ACCESS ROUTE AND ACCESS REQUIREMENTS WITH CONTRACTOR'S ENGINEER PRIOR TO CONSTRUCTION.
2. MANY OF THE BUILDINGS SHOWN ON THIS SITE PLAN HAVE BEEN REMOVED.



# Construction Access Rocky Flats Environmental Technology Site

CH2MHILL

ISSUE		CH2MHILL, INC.		9-19-05		POT	CMS	JRS	RER	JRS	CLASS		EBB42148	
DESIGN COMPANY		CH2MHILL		DATE		DSGN	CHKD	IN	APVD	PROJECT/CHARGE NO.		ROCKY FLATS OFFICE		
KEYWORDS		P. TSCHESCHKE		6-10-05		DESIGNED BY		B. MORVILLE		6-10-05		U.S. DEPARTMENT OF ENERGY		
1.		J. SCHNEIDER		6-10-05		DRAWN BY		J. SCHNEIDER		6-10-05		Rocky Flats Environmental Technology Site		
2.		R. RIKER		6-10-05		CHECKED BY		J. SCHNEIDER		6-10-05		GOLDEN, COLORADO		
3.		J. SCHNEIDER		6-10-05		UNLESS NOTED OTHERWISE		INDEPENDENT VERIFIER		6-10-05		C-2 DAM OUTLET MODIFICATIONS		
4.		J. SCHNEIDER		6-10-05		REMOVE BURS AND SHARP EDGES		CLASS		CEX-105-01		SITE MAP, ABBREVIATIONS, AND CONSTRUCTION ACCESS		
5.		J. SCHNEIDER		6-10-05		NEXT ASSEMBLY		CLASS		CEX-105-01		SCALE		
BLDG./FACILITY		NA		NA		SCALE		NA		NA		SIZE		
ROOM/AREA		NA		NA		SCALE		NA		NA		DRAWING NUMBER		
GRID COORD./ELEV. NO.		NA		NA		SCALE		NA		NA		ISSUE		
GRID COORD./ELEV. NO.		NA		NA		SCALE		NA		NA		SHEET		
GRID COORD./ELEV. NO.		NA		NA		SCALE		NA		NA		2 of 6		



SOURCE:  
TOPOGRAPHY IS FROM MERRICK, DRAWING SERIES 39873-XXX, DATED 1992. SOME CONTOURS IN THE VICINITY OF THE EXISTING INLET STRUCTURE WERE MODIFIED BY OTHERS TO FIT VISUAL OBSERVATIONS AND THE 1979/1980 AS-BUILT DRAWINGS OF THE C-2 DAM.

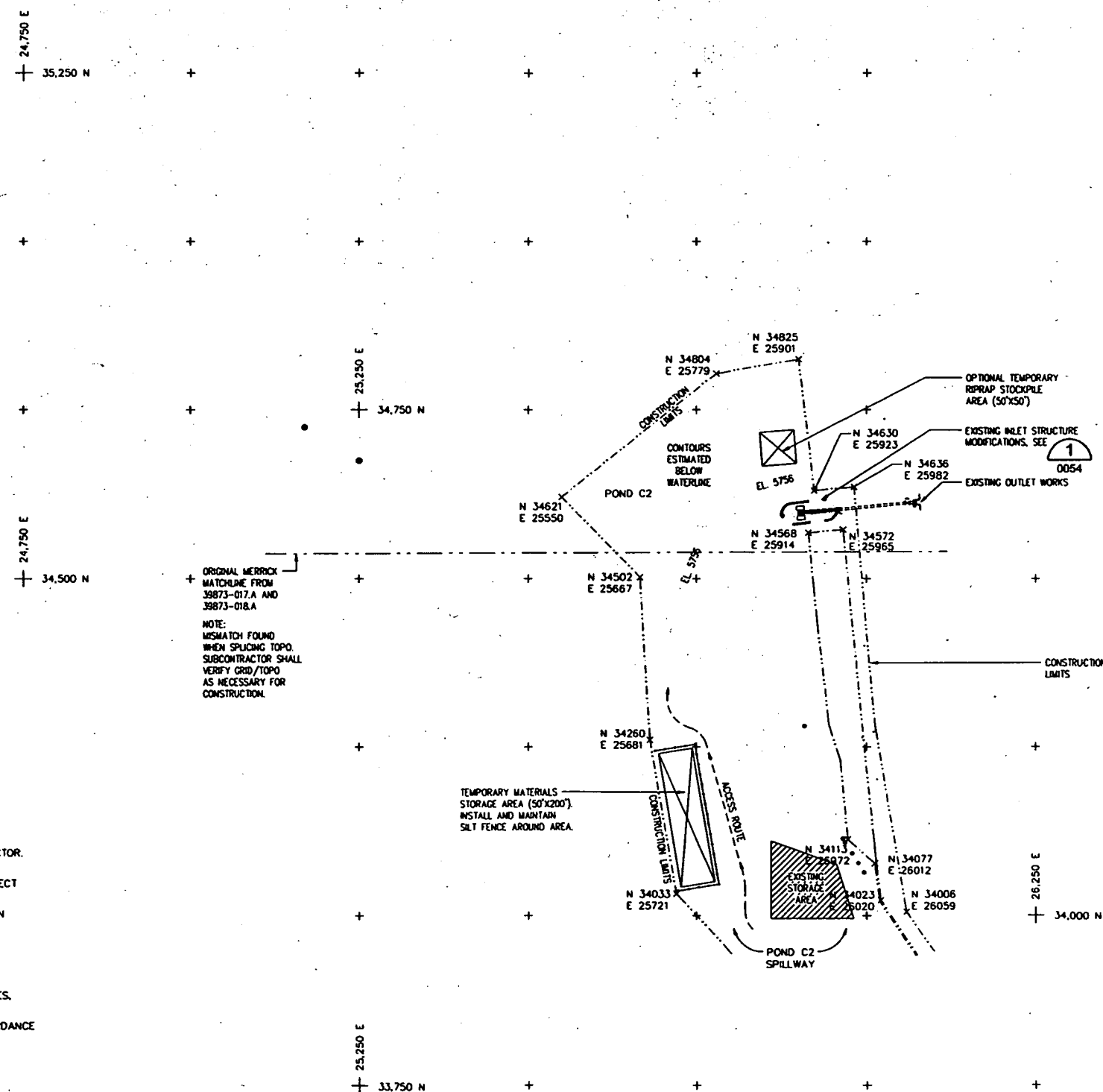
ALL UNDERWATER (BELOW 5757) TOPOGRAPHY IS ESTIMATED.  
CONSTRUCTION SUBCONTRACTOR TO VERIFY PRIOR TO CONSTRUCTION AS NECESSARY.

**NOTES:**

















1. COORDINATES ARE ROCKY FLATS PLANT COORDINATE SYSTEM.
2. MAXIMUM RESERVOIR CAPACITY = 70 ACRE FEET AT ELEVATION 5765.3 .
3. COFFERDAMS SHALL BE BUILT AROUND THE OUTLET WORK AREA AND IN THE SOUTH INTERCEPTOR DITCH. SIZING TO BE DETERMINED BY SUBCONTRACTOR AND / OR AS DIRECTED BY THE CONTRACTOR.
4. THE CONSTRUCTION SUBCONTRACTOR IS RESPONSIBLE FOR PROVIDING AND MAINTAINING A TRAFFICABLE SURFACE SUITABLE FOR THE CONSTRUCTION EQUIPMENT NECESSARY FOR THIS PROJECT ACCESS ROAD.
5. CONSTRUCTION SUBCONTRACTOR SHALL AVOID, OR PROTECT AS NECESSARY, ALL INSTRUMENTATION ALONG THE DAM CREST.
6. ALL STAGING AND STOCKPILING AREAS SHALL BE WITHIN THE LIMITS OF CONSTRUCTION AND BE APPROVED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
7. CONTRACTOR WILL PROVIDE INSTRUCTIONS FOR DISPOSAL OF ALL ITEMS TO BE REMOVED.
8. CONSTRUCTION SUBCONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FEATURES, UTILITIES, AND VEGETATION, PRIOR TO CONSTRUCTION.
9. CONSTRUCTION SUBCONTRACTOR IS RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH PROCEDURES AND REQUIREMENTS ESTABLISHED BY CONTRACTOR.



PLOT DATE: 09/20/2005 01:42:23 PM  
C2-Dam-C3 323208.dgn



### LEGEND

- |   |                              |
|---|------------------------------|
|  | UTILITY POLE                 |
|  | BURIED VALVE                 |
|  | WELL                         |
|  | DIRT ROAD                    |
|  | EDGE OF WATER - AS OF SURVEY |
|  | BARBED WIRE FENCE            |
|  | 1 FOOT CONTOUR (LAND)        |
|  | 1 FOOT CONTOUR (BELOW WATER) |
|  | 5 FOOT CONTOUR (LAND)        |
|  | 5 FOOT CONTOUR (BELOW WATER) |
|  | CONSTRUCTION LIMITS          |
|  | PIEZOMETER/OBSERVATION WELL  |
|  | INCLINOMETER                 |
|  | DAM MOVEMENT MONUMENT        |
|  | BENCHMARK                    |
|  | CONTROL POINT                |

## POND C2

DAM CREST EL. 5775.3  
SPILLWAY CREST EL. 5765.3

NOTE:  
1978 DESIGN CREST, DRAWING SERIES 27165-XXX,  
IS EL. 5774.5 WITHOUT CAMBER.  
1978 DESIGN CREST USED HEREIN, UNLESS NOTED  
OTHERWISE.




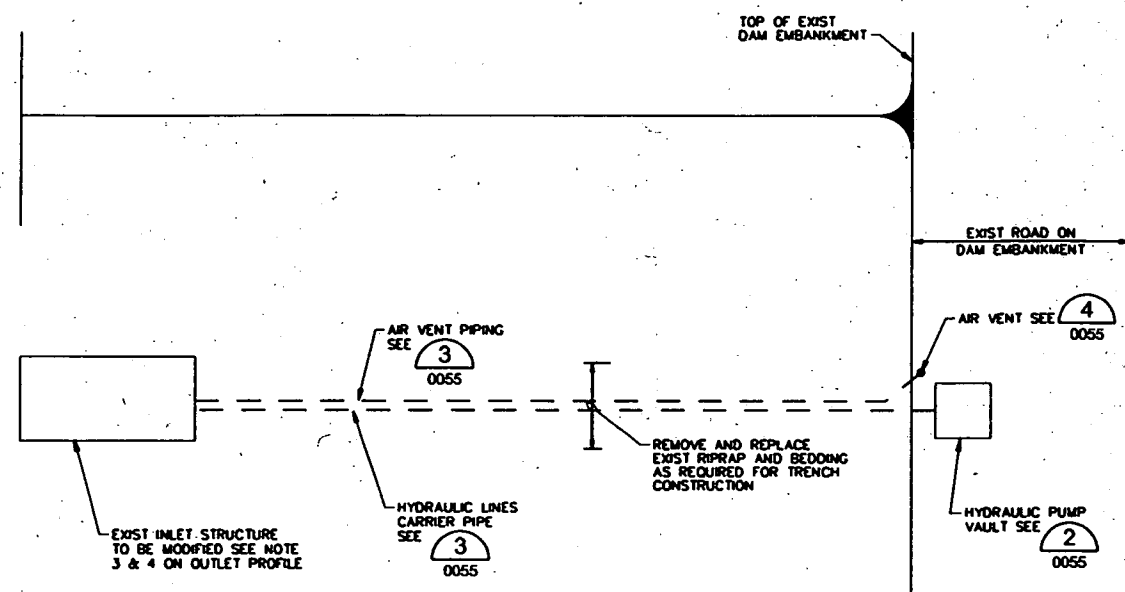
## RECORD DRAWINGS

Revisions Drawn By C. SCHNEE Date SEPT 2005

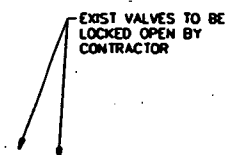
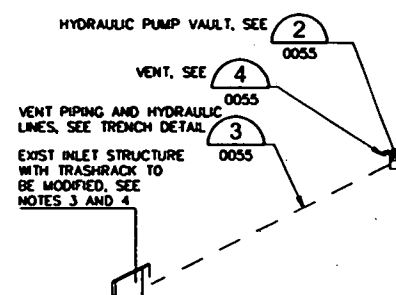
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**C-1546A**

		<h1 style="text-align: center;">RECORD DRAWINGS</h1>										
<b>ISSUE</b> CH2MHILL, INC. DESIGN COMPANY		<b>9-19-05</b> DATE		<b>POT</b> DESIGN	<b>CMS</b> DRAWN	<b>JRS</b> CHECKED	<b>RER</b> IN	<b>JRS</b> APPROVED	<b>03-105-B</b> CLASS		<b>EBB42148</b> PROJECT/CHARGE NO.	
<b>KEYWORDS</b>  1. 2. 3. 4. 5.		<b>TOLERANCES</b> FRACT. 2 ANGLES 5 DEC.		<b>DESIGN COMPANY: CH2MHILL</b> DESIGNED BY <b>P. TSCHESCHKE</b>				<b>U.S. DEPARTMENT OF ENERGY</b> ROCKY PLATE OFFICE				
				DRAWN BY <b>B. NORVILLE</b>				GOLDEN, COLORADO				
				CHECKED BY <b>J. SCHNEIDER</b>				Rocky Flats Environmental Technology Site GOLDEN, COLORADO				
		UNLESS NOTED OTHERWISE		INDEPENDENT VERIFIER <b>R. RIKER</b>				<b>C-2 DAM OUTLET MODIFICATIONS</b>				
REMOVE BUMPS AND SHARP EDGES				APPROVED BY <b>J. SCHNEIDER</b>								
BEST ASSEMBLY <b>NA</b>				<b>GLASSER</b> <b>CEX-105-01</b>				<b>GENERAL SITE PLAN</b>				
SCALE:		ADDITIONAL APPROVALS				SIZE		DRAWING NUMBER		ISSUE		
BLDG./FACILITY <b>SITE</b> ROOM/AREA <b>NA</b> GRID COORD./COL. NO. <b>NA</b>						<b>D 51420-0053</b>		<b>0</b>		<b>3 of 6</b>		



PLAN 1  
NTS 0053



NOTES:

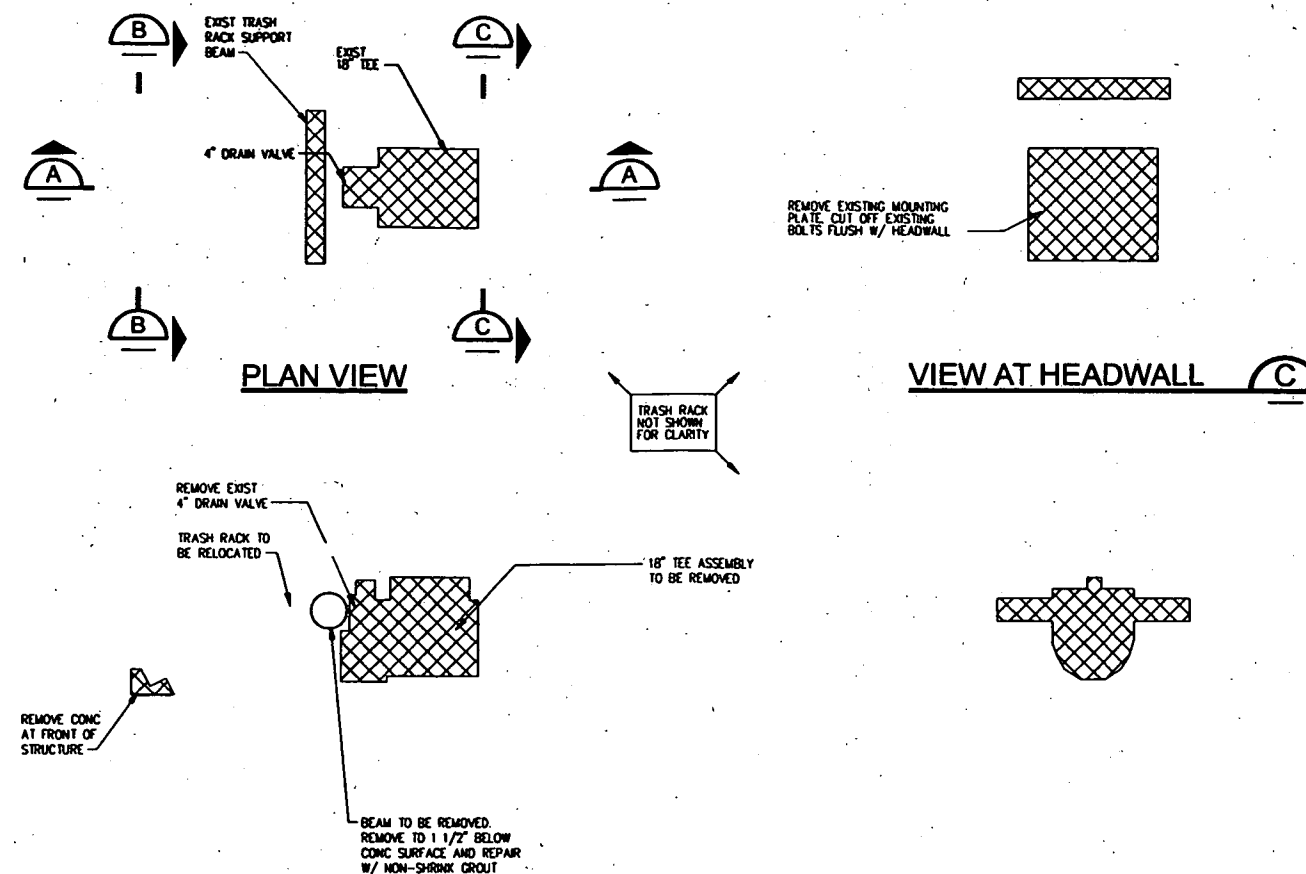
- 1) DAM FACE GEOMETRY PER 1978 DESIGN PLANS. CAMBER IS IGNORED. CONSTRUCTION SUBCONTRACTOR TO VERIFY PRIOR TO CONSTRUCTION AS NECESSARY.
- 2) GEOTECHNICAL DATA ON SUBSURFACE CONDITIONS ARE AVAILABLE FROM THE CONTRACTOR, INCLUDING 1978 DESIGN PLANS, FINAL GEOTECHNICAL ANALYSIS FOR DAM UPGRADES (11/94) AND OTHERS.

- 3) FEATURES OF THE EXISTING INTAKE STRUCTURE, AND ITEMS TO BE REMOVED ARE SHOWN ON 2

- 4) MODIFICATIONS TO THE EXISTING INLET STRUCTURE ARE SHOWN ON 1 0055

OUTLET PROFILE

1"=20'

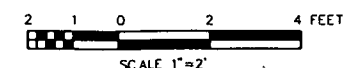


SECTION A

SECTION B

- NOTES:
1. RECORD DRAWINGS SHOWING THE TRASHRACK AND THE REINFORCING IN THE EXISTING STRUCTURE ARE AVAILABLE FROM THE CONTRACTOR. SEE AS-BUILT DRAWING 27163-241.
  2. RECORD DRAWING SHOWING DETAILS OF THE DRAIN VALVE AND 18\"/>

EXISTING INTAKE STRUCTURE 2



RECORD DRAWINGS

Revisions Drawn By C. SCHNEE Date SEPT 2005

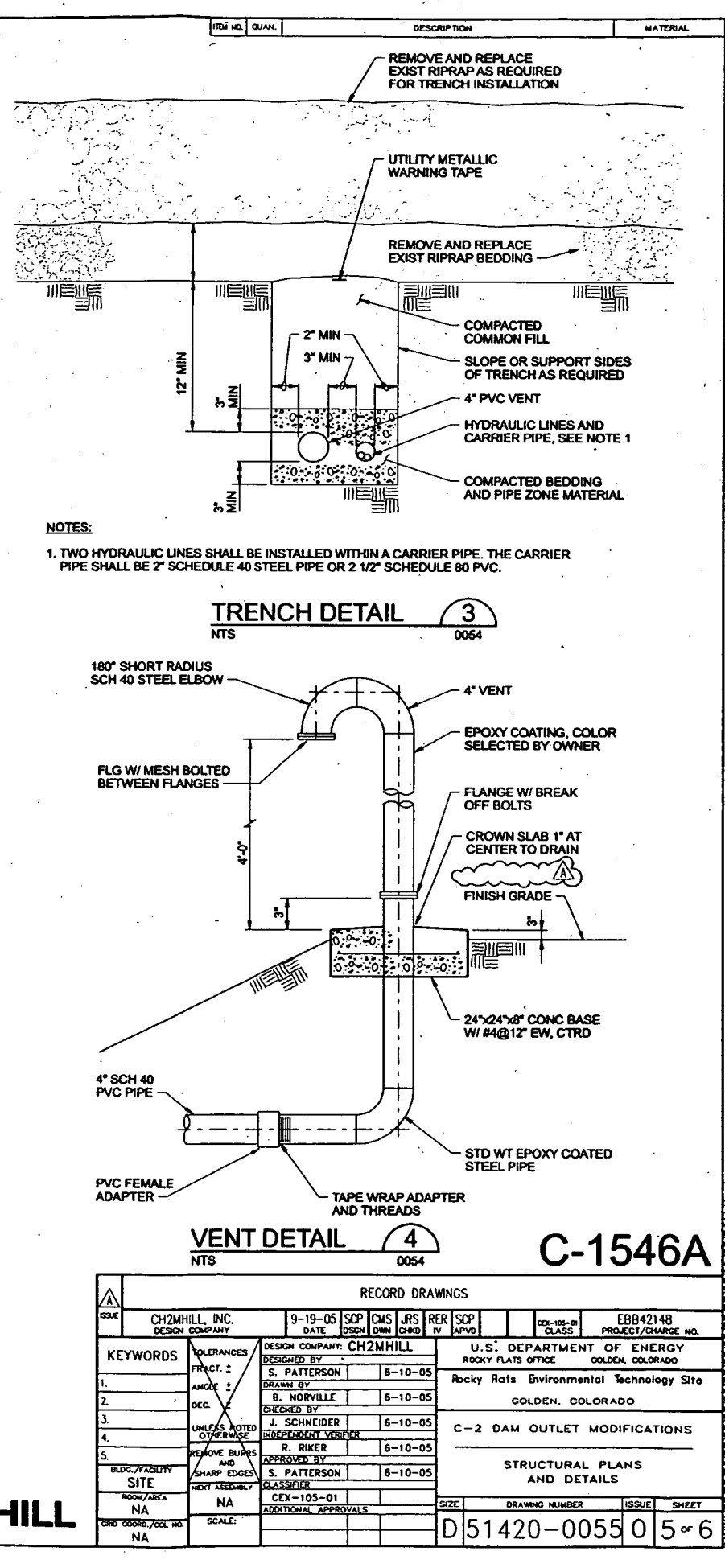
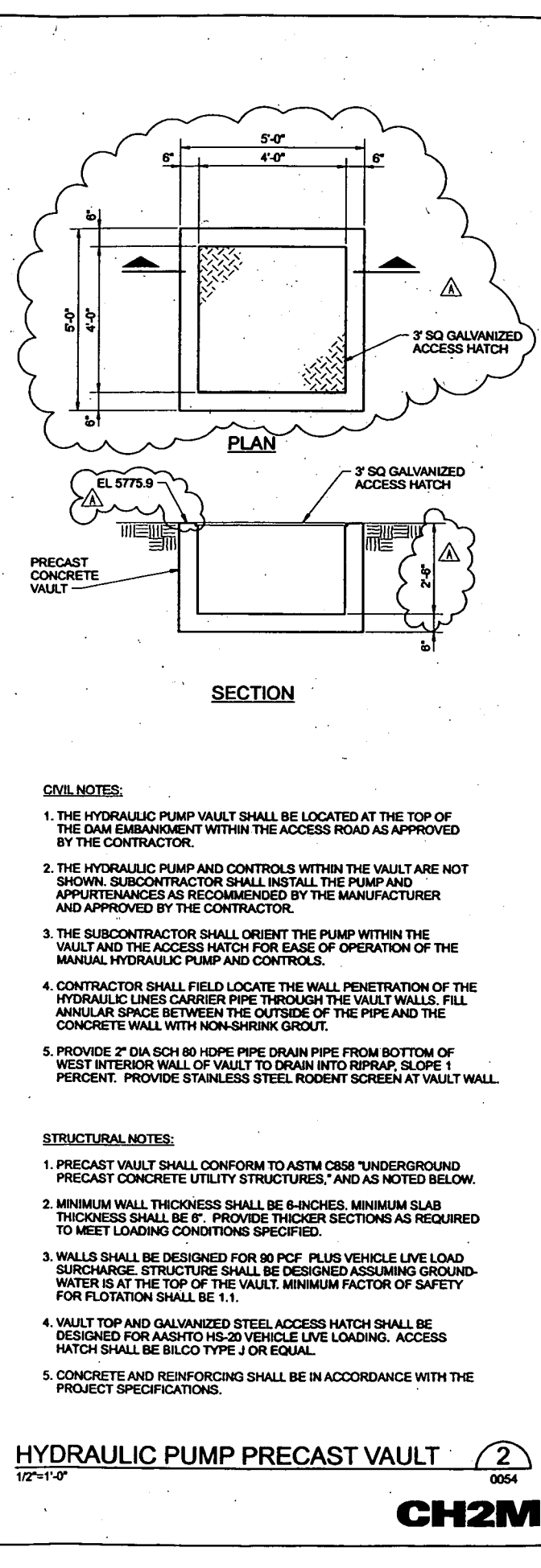
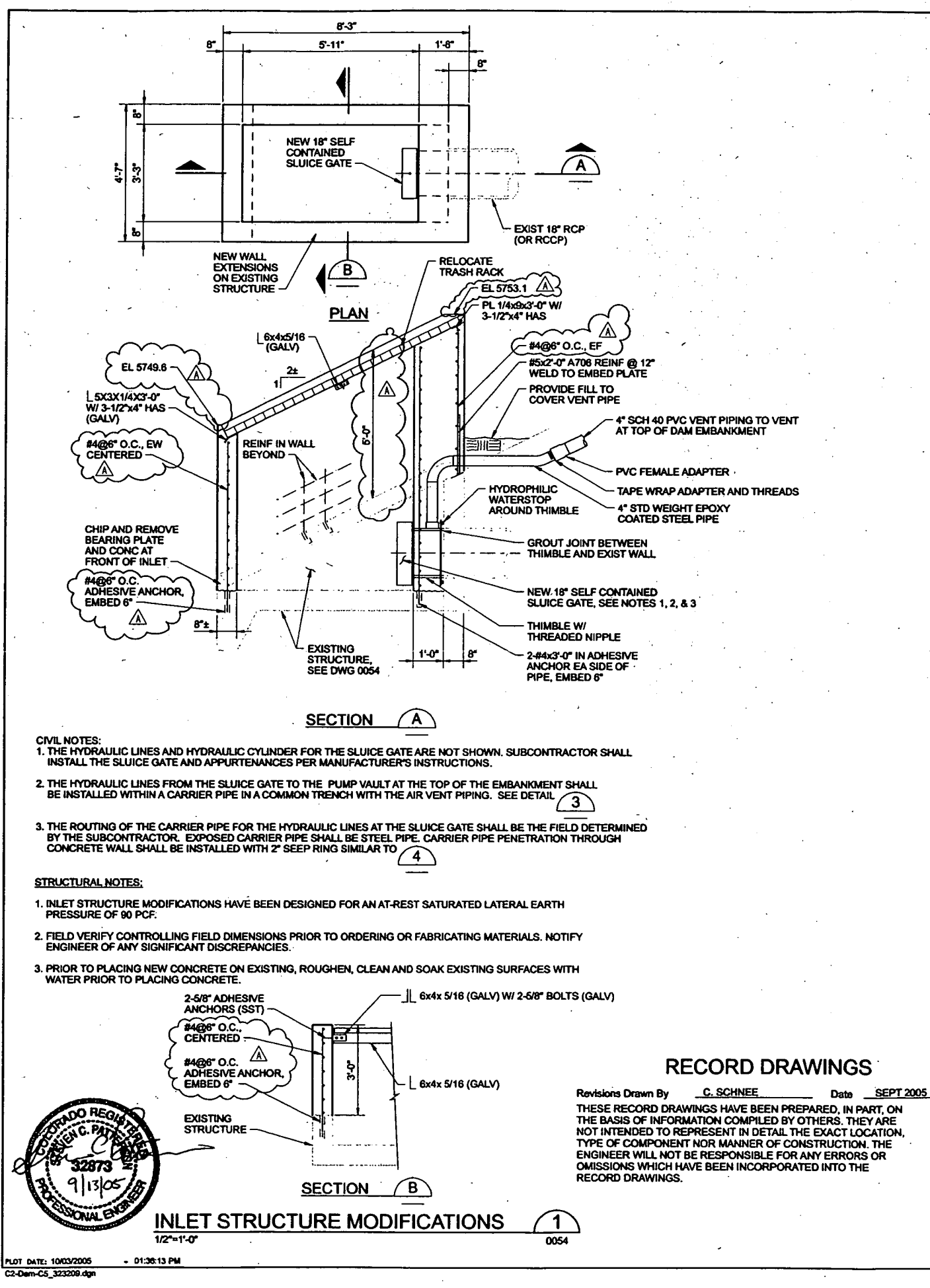
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C-1546A

RECORD DRAWINGS									
CH2MHILL, INC.	9-19-05	POT	CMS	JRS	RER	JRS	APVD	CO-105-01	EBB42148
DESIGN COMPANY	DATE	DSGN	CHKD	CHKD	CHKD	CHKD	CLASS	PROJECT/CHARGE NO.	
KEYWORDS									
TOLERANCES									
FRAC. 1/8"									
ANGLE 1/2"									
DEC.									
UNLESS NOTED OTHERWISE									
REMOVE BURRS AND SHARP EDGES									
BUDG./FACILITY									
SITE									
ROOM/AREA									
NA									
DRG COORD./COL. NO.									
NA									
DESIGN COMPANY: CH2MHILL									
DESIGNED BY: P. TSCHESCHKE 8-10-05									
DRAWN BY: G. MORVILLE 8-10-05									
CHECKED BY: A. SCHNEIDER 8-10-05									
INDEPENDENT VERIFIER: R. RIKER 8-10-05									
APPROVED BY: J. SCHNEIDER 8-10-05									
CLASSIFIED									
CEX-105-01									
ADDITIONAL APPROVALS									
U.S. DEPARTMENT OF ENERGY									
ROCKY FLATS OFFICE GOLDEN, COLORADO									
Rocky Flats Environmental Technology Site									
GOLDEN, COLORADO									
C-2 DAM OUTLET MODIFICATIONS									
DETAILS									
SIZE									
DRAWING NUMBER									
ISSUE									
SHEET									
D 51420-0054 0 4 of 6									

CH2MHILL

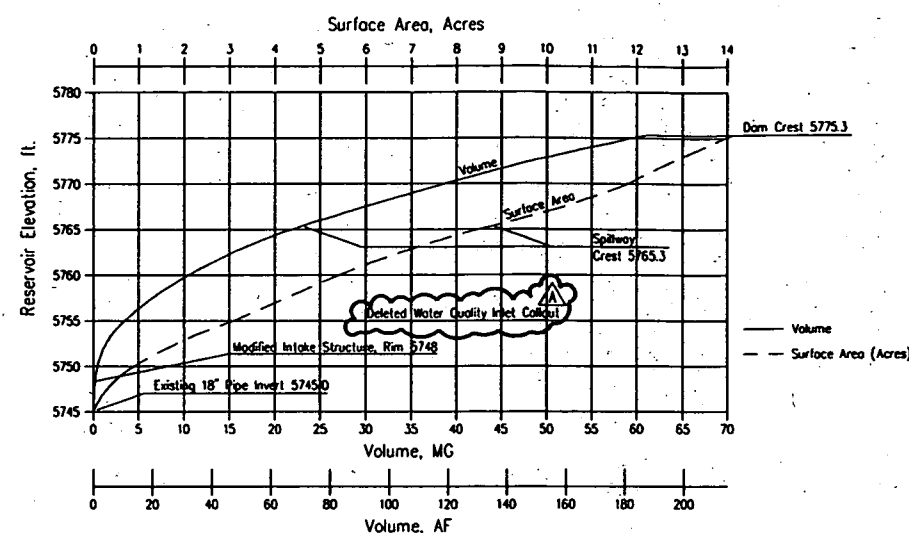






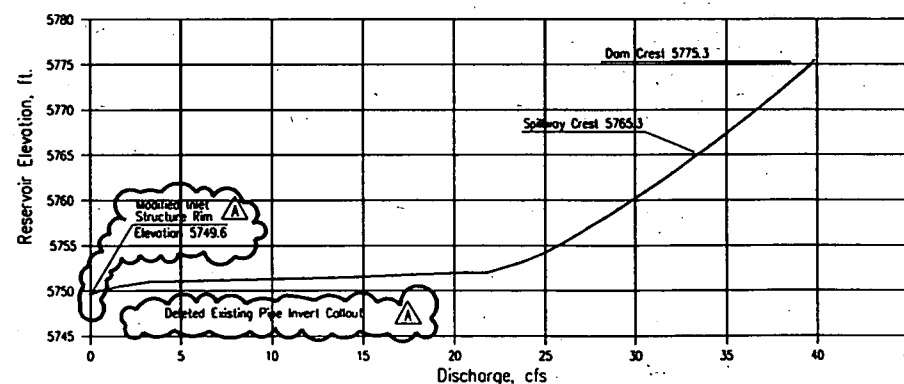
Reservoir Elevation (ft.)	Volume (AF)	Volume (MG)	Surface Area (Acres)
5746	0.0	0.0	0.2
5747	0.1	0.0	0.2
5748	0.4	0.1	0.4
5749	0.8	0.2	0.6
5750	1.3	0.4	0.9
5751	2.2	0.7	1.3
5752	3.5	1.1	1.7
5753	5.2	1.7	2.1
5754	7.6	2.5	2.6
5755	10.4	3.4	3.1
5756	13.8	4.5	3.7
5757	17.8	5.8	4.2
5758	22.1	7.2	4.5
5759	26.8	8.7	4.9
5760	32.0	10.4	5.4
5761	37.7	12.3	6.0
5762	44.0	14.3	6.5
5763	50.7	16.5	7.0
5764	58.0	18.9	7.6
5765	66.0	21.5	8.5
5765.3	68.5	22.3	8.8
5766	75.1	24.5	9.7
5767	85.1	27.7	10.3
5768	95.6	31.2	10.8
5769	106.8	34.8	11.4
5770	118.4	38.6	11.8
5771	130.4	42.5	12.2
5772	142.8	46.5	12.6
5773	155.7	50.7	13.1
5774	169.0	55.0	13.5
5775	182.8	59.5	14.1

NOTE:  
DAM STAGE, STORAGE AND SURFACE AREA CURVES  
WERE DEVELOPED BY OTHERS.



C-2 DAM STAGE, STORAGE  
AND SURFACE AREA CURVE

Reservoir Elevation (ft.)	Actual Q, cfs
5749.60	0
5750.00	0.49
5751.00	3.23
5752.00	20.84
5753.00	23.47
5754.00	24.82
5755.00	25.72
5756.00	26.59
5757.00	27.44
5758.00	28.36
5759.00	29.05
5760.00	29.83
5761.00	30.58
5762.00	31.32
5763.00	32.04
5764.00	32.74
5765.00	33.43
5766.00	34.11
5767.00	34.77
5768.00	35.42
5769.00	36.06
5770.00	36.68
5771.00	37.30
5772.00	37.91
5773.00	38.50
5774.00	39.09
5775.00	39.67
5775.30	39.84



C-2 DAM OUTLET  
DISCHARGE RATING CURVE

## RECORD DRAWINGS

Revisions Drawn By C. SCHNEE Date SEPT 2005

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

C-1546A



CH2MHILL

RECORD DRAWINGS										
ISSUE	CH2MHILL, INC. DESIGN COMPANY	9-19-05	PDT	CMS	JRS	RER	JRS	CEX-105-01	CLASS	EB842148 PROJECT/CHARGE NO.
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4. UNLESS NOTED OTHERWISE		REMOVE BURRS AND SHARP EDGES		CLASSIFIER		CEX-105-01		ADDITIONAL APPROVALS		
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**OPERATIONS AND MAINTENANCE  
INSTRUCTIONS**

**FOR**

**ROCKY FLATS SURFACE WATER  
CONTROL PROJECT  
(DAMS & RESERVOIRS)**

**1980**

**REVISED AUGUST 1984**

**SUPPLEMENT NO. 2 MARCH 1998**

**REVISED SEPTEMBER 2005**

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OPERATION AND MAINTENANCE  
INSTRUCTIONS  
FOR  
ROCKY FLATS SURFACE WATER CONTROL PROJECT

**INTRODUCTION**

The Operation and Maintenance Instructions for the Surface Water Control Project have been prepared to provide the information and data needed by operating personnel for the operation of the project works. This O & M Manual consists of the project works, instructions for normal operations, procedures to be followed in the event of abnormal operation, and inspection and maintenance instructions. Included are an Operation Log, Monthly Observation Report, Piezometer Field Sheet, Flume Ratings, an Inspection and Maintenance Schedule, a List of References, and Capacity Charts. The Operation Log or a log book is a suggested form for keeping records of routine operation of the dams and reservoirs; the Inspection and Maintenance Schedule is a summary of the recommended observation, inspection and maintenance frequency and procedures; the list of References gives dam drawing numbers and titles, engineering report titles, and the names of General Contractors, subcontractors, and materials and equipment suppliers for various Surface Water Projects. The outlet works rating curves are contained within the referenced drawing series where data is available and applicable. The reservoir areas and capacities at various reservoir levels are shown on the Capacity Charts herein.

These instructions do not contain information on major repairs. Operating personnel at Rocky Flats should not be expected to correct problems that cannot be corrected by following the operating procedures, or by normal maintenance functions, such as lubrication and regular adjustments. Skilled personnel will be needed to make monthly observations, to perform more extensive maintenance work, and to make necessary repairs. Manufacturers should be contacted for instructions on equipment repair work.

In 1983 signs of distress were noted in Dam B-5. Modifications to this manual were made in 1984 to incorporate repairs and changes in operation procedures.

In late 1995 and early 1996, engineering designs for the upgrading of the reservoir outlet works in the existing A-4 and B-5. An operation and maintenance manual to supplement the August 1984 Operations and Maintenance Instructions for Rocky Flats Surface Water Control Projects (Dams and Reservoirs) was prepared. The supplement is incorporated into this update to the manual. The A-4 Dam outlet modifications construction were completed in 1996. The B-5 outlet modifications were completed in 1998. An alternate design and modifications to the C-2 outlet were made in 2005 and further modifications to B-5 were also made at that time. This manual is to reflect as-constructed conditions and to include manufacturer's operation and maintenance instructions for these modifications as well.

**DESCRIPTION AND PURPOSE**

The Rocky Flats Surface Water Control Projects consist of twelve earthfill dams and appurtenant spillways, two concrete and rockfill diversion dams, and about four miles of canals. The various features of the project are located outside of the (former) Industrial Area (IA) of the Rocky Flats Environmental Technology Site (RFETS), and access is from roads from the west of the site as shown on dam location and access roads map in the Appendices.

The purpose of the project is to collect runoff originating west of the plant and divert the flow around the plant site; and to collect runoff from the former IA and store it or safely route it through the site.

**TABLE 1 – MAJOR STORMWATER FEATURES AND FUNCTIONS**

Stormwater Feature	Function
<b>A-4 Dam</b>	Stores or passes the 100-year plant runoff in North Walnut Creek and passes greater flows. During normal operation water is retained, sampled, and discharged when water quality standard are met.
<b>B-5 Dam</b>	Stores or passes the 100-year plant runoff in South Walnut Creek and passes greater flows. During normal operation water is retained, sampled, and discharged when water quality standard are met.
<b>C-2 Dam</b>	Stores or passes the 100-year plant runoff in Woman Creek area and passes greater flows. During normal operation water is retained, sampled, and discharged when water quality standard are met.
<b>Landfill Dam</b>	Stores or passes the 100-year event (runoff and seepage from the Sanitary Landfill).
<b>A-3 Dam</b>	Routes North Walnut Creek flows into A-4 and provides additional storage on capacity.
<b>A-1, A-2, B-1, B-2, and B-3 Dams</b>	Provide a small amount of emergency capacity and provide wetlands habitat. No available data indicates that these dams were designed to store or pass any specific storm events.
<b>B-4 and C-1 Dam</b>	Flow through structures that provide some flow attenuation and settlement. No available data indicates that these dams were designed to store or pass any specific storm events.
<b>North Walnut Creek Diversion Structure</b>	Intercepts flow from North Walnut Creek and delivers water to any of the A series dams.

South Walnut Creek Diversion Structure	Intercepts flow from South Walnut Creek and delivers water to either B-1 or B-4.
West Interceptor Canal	Intercepts 100-year runoff from west of Industrial Area and delivers water to Walnut Creek Diversion Dam.
Walnut Creek Diversion Dam	Diverts 100-year flow from Walnut Creek and West Interceptor Canal through headworks into McKay Bypass Canal. Passes larger flows.
McKay Bypass Canal	Bypasses 100-year flow from Walnut Creek Diversion Dam around the A-4 and B-5 dams.
McKay Bypass Pipeline (operated and maintained by the City of Broomfield).	Intercepts flows in the McKay Bypass Canal and delivers water downstream of Broomfield Diversion Structure.
Woman Creek Diversion Dam	Diverts 100-year flow from Woman Creek through headworks into Woman Creek Bypass Canal. Passes larger flows.
Woman Creek Bypass Canal	Bypasses 100-year flow from Woman Creek Diversion Dam around the C-2 dam.
South Interceptor Ditch	Intercepts 100-year runoff from the southern portion of the Rocky Flats Plant and delivers water to C-2 dam.

### Operating Personnel

Operating personnel will operate the outlet works valves and pumps as required to make necessary water releases and transfers. The operators should keep a log book or sheets of outlet works valve positions or pump settings, dates and times when changes are made, reservoir levels, flume flow measurements and other operating and repair data. A suggested Operations Log form is included in the Appendices of this manual.

### DESCRIPTION

#### Dams and Reservoirs

Dams A-4, B-5, and C-2's homogenous embankments are constructed of predominantly clayey material obtained from required spillway excavation or borrow areas. Located at the center of the foundation of each dam is a cutoff trench extending to claystone bedrock for the length of the structure. The 2 1/2:1 (horizontal to vertical) downstream slopes of the dams are covered with 1 foot of seeded topsoil, while the upstream 2:1 slopes have 18 inches of riprap slope protection underlain by 9 inches of bedding material, except for Dam B-5 as discussed below. The upstream riprap slope protection on A-4 dam extends down to the berm, and below the berm the slope is protected by seeded topsoil. However, C-2 dam has no upstream berm and the riprap extends to original ground. The 20-foot wide crest of each dam is surfaced with 4 inches of selected roadway surfacing material.

Dam B-5, as modified in 1984, has an upstream slope of 2 1/2:1 from the crest to mid-height covered with at least 12 inches of riprap bedding and 18 inches of riprap, and a 5:1 slope from mid-height to the toe with no protective covering. Modifications to the outlet in 1998 installed a 8 foot wide berm covered with riprap running up the central portion of the dam at 3.6:1 feet per feet under the valve stem for support. Upstream of the dam a sand and perforated pipe drain beg was installed to filter remaining sediment and to provide a means to drain the reservoir below the elevated inlet.

The purpose of the A-4, B-5, and C-2 Dams is to detain surface water originating on the site until it is determined that the impounded water is free of contamination, and to permit treatment of the water if any contamination is detected. These dams were designed for flood detention, and not for permanent water storage. Flood storage should be released as soon as practical to provide storage for a subsequent flood event. Rocky Flats operating personnel will issue instructions governing testing and releasing of floodwaters. The reservoirs formed by Dam's A-4, B-5, and C-2 are designed to hold in excess of the runoff produced by a 100-year precipitation event.

The Landfill Dam was built in 1974 as part of renovations to the sanitary landfill. The Landfill Dam was keyed to bedrock and was constructed as a zoned dam from site soils, with semipervious clayey or silty sand and gravel outer shells and a relatively impervious clay core. The upstream slope of the dam was constructed at a 3:1 slope and the downstream at a 2.5:1 slope. The normal maximum water surface elevation, as indicated on the design drawings, was expected to be at the spillway.

The A-3 Dam was built in 1974. The A-3 Dam was keyed to bedrock and was constructed as a zoned dam from site soils, with semipervious sandy gravelly outer shells and a relatively impervious clay core. Dam A-3 was also equipped with a internal drain. The upstream slope of the dam was constructed at a 3:1 slope and the downstream at a 2.5:1 slope. The A-3 Dam does have features consistent with those designed for long term storage.

The A-1, B-1, B-2, B-3, B-4, and C-1 Dams were built in the 1950's and 1960's as small, poorly compacted, earthen dikes. As part of a project to increase water retention capabilities, the dams were enhanced and enlarged in 1972 and new Dam A-2 was built. The dams were built from clayey site soils. The enlarged dams, with the exception of Dam A-1, were equipped with internal drains. Dam A-2 was keyed into stable soil, and was constructed as a zoned dam, with semipervious sand-clay outer shells and a relatively impervious clay core. Upstream slopes at all dams were designed at 2:1, and downstream slopes at 2.5:1, except A-2 which was designed at 2:1. These dams were designed with features consistent with standard design for long-term water retention, as described above. Historically, these dams have performed acceptably during reservoir elevation conditions up to their spillways.

In 1991, the B-1 Dam downstream slope was flattened from a 1.5:1 to a 2:1 slope and clean, free draining gravel installed in the toe with a riprap covering to protect against further erosion from B-2 tailwaters. In 1995, sand/rock filter blankets were installed at the downstream toe of the B-2 and B-4 Dam's to control

seepage. Sediment removal operations in B-2 and B-3 in 2005 may have at least partially modified or damaged toe drains at B-1 and B-2.

Modifications to the C-1 Dam structure were completed in 2005, which included removal of the existing outlet structure and filling the existing spillway, and installing a new grouted boulder discharge channel with a stop log structure to regulate the water level and maintain water within the reservoir. The same type of modification has been designed for A-1, A-2, B-1, B-2, B-3, and B-4 but had not been implemented at the time of this writing. Reservoir data, including capacities, elevations, and other pertinent data are shown in the Appendices.

#### Spillways

The A-4, B-5, and C-2 emergency spillways are ungated, open-channel, earth-lined structures with 3:1 side slopes. The bottom widths of the spillways are 150 feet, 80 feet, and 250 feet, respectively, for A-4, B-5 and C-2 dams. Each spillway was overexcavated by 9 to 12 inches and topsoil was replaced and seeded. All three spillway channels have a long, flat, section to minimize erosion. In each spillway channel, the flat section has claystone bedrock underlying the topsoil for the most part. The spillways are designed to handle floods in excess of the 100-year event for pre site reconfiguration conditions. Runoff from a pre site reconfiguration Probable Maximum Precipitation or Thunderstorm event will be safely passed through these spillways. Although this would be a rare event, it is not considered to be an unusual condition.

The Landfill Dam emergency spillway is an ungated concrete box culvert and open-channel, earth-lined structure with 2:1 side slopes and bottom width of 10 feet. The spillway is topsoiled and seeded. The spillway is capable of handling flows from the 100-year event for pre site reconfiguration conditions.

The A-3 Dam emergency spillway is an ungated, open-channel, earth-lined structure with 3:1 side slopes. The spillway is armored with riprap and bedding, and has a cutoff wall at the downstream edge of the dam crest. The spillway is capable of handling flows from the 50-year event for pre site reconfiguration conditions.

The A-1, A-2, B-1, B-2, and B-3 emergency spillways are ungated, open-channel, earth-lined structures capable of routing the pre site reconfiguration conditions 50-year storm in the case of A-1 and A-2, and the 100-year in the case of B-3. Due to modifications to the B-1 and B-2 spillway during sediment removal operations in 2005, the spillway capacities are unknown for those dams. The A-2, B-2 and B-3 Dams are equipped with service spillways consisting of corrugated metal pipes with ungated concrete inlets that operate at a elevation and capacity lower than the emergency spillway elevation. The B-4 Dam spillway serves as the emergency and service spillway, as well as outlet structure, and consists of a concrete box culvert and concrete chute with a flip bucket energy dissipation structure that is capable of routing the 50-year event. The B-1 Dam service spillway was inadvertently grouted partially full during efforts to line the conduit with a plastic pipe, and was subsequently grouted full to render it totally inoperable.



### Outlet Works

Under the A-4, B-5, and C-2 Dams is an 18-inch prestressed concrete cylinder pipe which serves as an outlet. The pipe is resting on a poured concrete cradle. An inlet structure with trashrack connects to the 18-inch prestressed concrete cylinder pipe. Each outlet conduit has six concrete cutoff collars spaced at 20-foot intervals. Near the downstream end of the conduit, an 18-inch medium pressure gate valve is installed. The original outlet valve, a gate valve, is buried 4 feet underground near the outlet structure. The valve is covered with a valve box that has a locking device on the cover. Within a few feet of the box is a section of galvanized pipe embedded vertically in the ground to provide a holder for the valve wrench. A butterfly valve is bolted on the outlet end of each outlet pipe. These valves are left (locked where possible) open and should only to be used as emergency backup valves. The energy developed by water flowing through the sloped outlet pipe is dissipated in a concrete impact-type stilling basin. A concrete Parshall flow-measuring flume with a galvanized steel liner is installed below the impact-type outlet structure. The gauge house contains flow monitoring and measuring equipment, while a separate shed houses water quality monitoring equipment. Inlet and outlet channels have a maximum side slope of 3:1 and are topsoiled and seeded.

The primary purpose of the outlet modifications performed in the 1990's and 2005 at A-4, B-5, and C-2 was to provide upstream control gates at each dam. Secondly, in conjunction with the upstream outlet control, an inlet control structure was provided at a raised elevation to provide controlled detention operation for water quality management. A low-level valve was provided to drain the reservoir below the inlet control structure at A-4, while an existing 6-inch diameter pipe with a gate valve connected to the inlet structure on Dam B-5 to permit shutoff of the drain system was left in place with modification to the drain to add a standpipe with an intake above the reservoir bottom. C-2 has no low level valve.

The control gate for the inlets at A-4, B-5, and C-2 are slide gates. The face of the gates are specially machined to reduce seepage to a negligible amount (100 to 200 gallons per day). In addition, the 6-inch drain gate valve at B-5 experiences minor leakage. The slide gate operating stems at A-4 and B-5 are located within a synthetic oil-filled encasement pipe. The C-2 gate is hydraulically actuated and also uses a synthetic oil of a different type. See the References section for the name and supplier of the synthetic oils. Oil should be checked as part of a regular maintenance schedule.

B-5 can alternatively be transferred to A-4 through an existing pump line located at the side of the spillway. Two flat areas are located in the reservoir basin at the spillway which are pump stations.

The Landfill Dam outlet consists of a controlled low level outlet consisting of a 10" diameter ductile iron pipe with a butterfly valve installed on the upstream end and gate valve on the downstream end. The inlet is a concrete structure with trashrack. Eight concrete cutoff collars are located along the pipe. Normal operations in the past have consisted of pumping water from the Landfill Dam to North Walnut Creek, however, this capability has been removed. The energy developed by water flowing through the sloped outlet pipe is dissipated in a concrete impact-type stilling basin.

The A-3 Dam has a controlled low level outlet consisting of a 16" diameter ductile iron pipe that necks down to a 12" diameter pipe with a gate valve and a butterfly valve on the downstream end. The inlet is a concrete structure with trashrack that rests on the bottom of the reservoir. The energy developed by water flowing through the sloped outlet pipe is dissipated in a concrete impact-type stilling basin. A concrete Parshall flow-measuring flume with a galvanized steel liner is installed below the impact-type outlet structure.

The A-1 Dam outlet structure, a 48 inch corrugated metal pipe, is grouted shut and inoperable. The upstream gate of the A-2 Dam outlet, a 10 inch ductile iron pipe, has been dismantled and a grout plug installed in the pipe, and is inoperable. The B-1 dam outlet, a 10" ductile iron pipe with valve, is grouted shut from the downstream end to the valve. The B-2 Dam outlet is a 10 inch diameter ductile iron pipe plugged with grout on the upstream end and with a valve that is not known to be operable. Normal operation for B-2 consists of pumping the reservoir through a underground transfer line that runs from B-2 to A-2. The B-3 dam outlet is an operational gated 10 inch ductile iron pipe with a 2.5 foot riser on the inlet, that exits into the 48 inch corrugated metal pipe that serves as the service spillway. The concrete spillway previously described serves as the outlet for the B-4 dam. The C-1 Dam's 48 inch corrugated metal pipe outlet has been removed and replaced with a channel with a stop log structure to enable water to be stored in the reservoir. The configuration has been designed so that the stop log structure can be removed in the future and the dam function as a fully breached structure. The same designs, which would also include removal of existing outlet structures, have been completed for the A-1, A-2, B-1, B-2, B-3, and B-4 Dams, but have not been implemented at this time.

#### Diversion Structures

The North and South Walnut Creek Diversion Structures are concrete walls built across the creeks that route flows through a 24 inch corrugated metal pipe into the furthestmost upstream dam in the series (A-1 and B-1), or through a 42 inch corrugated metal pipeline running on the south side of the A series dams on North Walnut Creek, or a 48 inch corrugated metal pipeline running on the south side of the B series dams on South Walnut Creek, to route the flows to a further downstream dam. The North Walnut Creek pipeline has valved diversion boxes that allow flow to be routed into A-2 via the A-1 outlet channel, into A-3 just downstream of A-2, and into A-4 through the A-3 spillway. The South Walnut Creek pipeline has no such boxes and will only route flows into B-4 just downstream of B-3. The North Walnut Creek Diversion Structure has a capacity of approximately 90 cfs before overtopping and flowing into A-1, which was less than the 2-year pre site reconfiguration storm event peak flows, while the South Walnut Creek Diversion structure has a capacity of approximately 160 cfs before overtopping and flowing into B-1, which was adequate for a pre site reconfiguration 100-year storm event.

#### Diversion Dams

The diversion dams are constructed with a cutoff wall of caulked interlocking steel sheet piles. The top of the steel cutoff wall is embedded into a 24-inch square concrete cap for the length of the structure. The steel piling extends approximately 15 feet below the concrete cap at Walnut Creek Diversion Dam. The Woman Creek Diversion Dam steel piling wall extends approximately 8 to 14 feet below the concrete cap

and is embedded 12 to 18 inches into claystone bedrock for the length of the structure. The 2:1 upstream slope has 36 inches of riprap slope protection underlain by 12 inches of bedding material. Upstream of this riprap is a ponding area protected by 6 inches of seeded topsoil. The 3:1 downstream slope has 48 inches of riprap slope protection underlain by 12 inches of bedding material. The headwork, of Walnut Creek Diversion Dam and Woman Creek Diversion Dam consist of three and seven, respectively, 60-inch corrugated metal pipes with cutoff collars.

The purpose of the diversion dams is to divert the 100-year flood run, originating west of the plant through the headworks into a canal passing the flow around the former IA. Larger amounts of runoff in excess of the 100-year flood will overflow the dam crest.

#### Canals

The canals traverse several sizeable areas of unstable slump prone materials. Several sections along the South Interceptor Ditch have experienced slumping and a decrease of cross section.

The canals consist of open-channel earth cut and fill sections interrupted by drop structures and road crossings where needed. Excavated portions of the canals produced materials for construction of adjacent fills and excess excavation was placed above and outside the required fill lines. Most of the canal slopes were excavated and placed at a 2:1 slope, while unstable areas were flattened up to a maximum of a 4:1 slope. Slopes are stabilized with 6 inches of topsoil that was placed across the entire width of canal and seeded.

Some of the canals have a considerable drop in elevation from the inlet to the outlet. The portion of the energy created by water dropping in elevation is dissipated by the use of rock grade controls, however, the structures along the McKay and the Woman Creek Diversion Canals have suffered heavy damage during large flows. Most of the rock grade controls drop 10 feet and have a 1-foot deep stilling basin at the bottom. A riprap dam was placed at the top of the drop to provide normal velocities and water surfaces in the preceding portion of the canal. The rock riprap dam is required primarily because of the closeness in spacing of some of the structures. The rock grade controls are protected by 24 inches of riprap placed on 12 inches of bedding material. In some sections of the canals, energy is dissipated by inverted siphon corrugated metal pipe crossings. The inverted siphon pipe crossings take the place of a rock grade control and provide a vehicle crossing. The inverted siphon pipes were used where a crossing or headworks was needed and excess elevation drop is not available.

TABLE 5 - CANALS PHYSICAL AND HYDRAULIC CHARACTERISTICS

Canal	Length (feet)	Total Drop (feet)	Maximum Normal Water Depth (feet)	Maximum Normal Flow (cfs)
West Interceptor Canal	784	0.16	3.85	91
McKay Bypass Canal	10,500	260.05	5.82	368
Woman Creek Bypass Canal	2,005	31.36	8.14	1,032

South Interceptor Canal	6,355	195.37	5.61	327
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## OPERATING INSTRUCTIONS

The Operating Instructions are intended to cover all normal operating functions of the Surface Water Control Project. Instructions for normal operation are limited to the outlet works valves of the dams because of the inherent automatic operations of the remainder of the project. Floods in excess of the pre site reconfiguration 100-year event up to the PMF will pass safely over the emergency spillways at the A-4, B-5, and C-2 Dams, and lesser storms in the remainder of the dams as indicated under "Spillways". Should emergency spillway flows occur, the flow over the spillway should be observed until such flow stops. After cessation of the flow, the spillway should be inspected for damage and repairs made as discussed under "INSPECTION AND MAINTENANCE INSTRUCTIONS" below. There is no need to operate the outlet works valves during spillway operation. Operating personnel should not attempt to repair malfunctioning mechanical equipment. Such repairs require the services of skilled personnel.

### Reservoirs

The water storage elevation should generally be maintained between 10 and 50 percent of reservoir capacity on each dam. This water level should typically be exceeded only for storm containment for short time intervals. The water levels in the reservoirs should not be drawn-down faster than a rate of 1 foot per day except under emergency situations, when the integrity of the dam is threatened. Discharge rates, which correspond to a drawdown rate of 1 foot per day for each reservoir are modeled with a spreadsheet that has been developed to aid in pond operations. In the case of Dam B-5, the upstream slope has been flattened to permit an increase in the drawdown whenever the reservoir level is below Elevation 5792 if necessary. Frequent use of rapid rates, in excess of 1 foot per day, can increase the risk of localized sloughing of the embankments and will cause increased sloughing of the unstable reservoir slopes.

### Drain Bed Valve - Dam A-4 and B-5

The drain valve for Dam A-4 is a 4-inch diameter valve. The operating stem for the A-4 drain valve extends to just above the Main Inlet, and a two foot length operating "key" is provided with the valve. The key is stored near the handwheel at the crest, and uses a standard 2-inch nut connection. These drain valves will not be operated except in the event of draining the ponds below the primary operating levels. This is anticipated only for maintenance purposes of the structures. The Dam B-5 6-inch diameter drain valve is located within the concrete tower structure. The operating stem is extended vertically to near the top of the concrete tower just above the water quality perforations. An opening is cut in the trash rack/safety grating to allow use of the drain valve key. An existing filter drain system which includes four branches of slotted PVC drain pipe installed in a filter drainage sand and a vertical riser pipe which extends approximately two-feet above the existing pond bottom provides inflow to the drain valve. C-2 does not have a drain valve.

### Outlet Works

The slide gate operators at A-4 and B-5 are handwheels located at the crest. For Dam A-4, there is a 24-inch diameter Main Gate and an 8-inch Water Quality Gate. Only one gate at a time should be operated to release water from Pond A-4. Dam B-5 has one 12-inch diameter slide gate. Dam C-2 is operated with a hydraulic hand pump located in a vault in the C-2 crest. A switch on the pump must be set to the close or open position prior to operating the hand lever on the pump. To make desired releases, the slide gates should be partially opened and the flow out of the reservoir observed at the staff gauge on the flume and the valve adjusted to produce the desired flow rate. A sufficient amount of time should be allowed between valve adjustments to allow the flow to stabilize before reading the flume.

Access to gate valves on the downstream end of the outlet pipes at A-3, A-4, B-5, and C-2 is through a locking cover on a valve box located several feet upstream of the end of each outlet. The valves are operated by the 6-foot T-handle valve wrench located in the holder between the valve box and outlet structure. **These valve are not currently used and are left in the open position unless failure of the primary valve necessitates using them as an emergency backup.** Each of these dams is also equipped with a butterfly valve located on the downstream end of the outlet pipe. The butterfly valve is operated with the same or similar valve wrench. At dam A-3, this butterfly valve is the primary operating valve for the outlet, and at the other dams are left open and used only as emergency backup.

The upstream butterfly valve at the Landfill Dam is operated by a handwheel located on the crest. The downstream gate valve is equipped with a handwheel located inside a manhole several feet upstream of the end of the outlet. Both valve are normally closed. To discharge through the outlet, **the downstream valve must be opened prior to opening the upstream valve or a water hammer will occur.**

In Dam's A-4, B-5, C-2, and the Landfill Dam, a pond will develop between the inlet elevation and the bottom of the reservoir. A-4 and B-5 have a drain valves in addition to the slide gate inlet (inlets for Dam A-4). Water below the inlet elevation at C-2 and the Landfill will have to be pumped if discharge is necessary. The A-3 inlet is located on the pond bottom so no pool will develop.

Under normal operations, Dam A-1 is discharged by pumping into the A Series Diversion Structure Pipeline diversion box to A-2 or A-3, or through its spillway into A-2. A-2 is discharged by pumping it to A-3 through its service spillway. B-1 is discharged by pumping through its spillway to B-2. B-2 is discharged by pumping through its service spillway to B-3. B-3 is discharged through a 10" overflow standpipe equipped with a gate valve with the operator located on the upstream face of the dam that is typically left open so the dam performs as a flow through structure. B-4 and C-2 perform as flow through structures and require no special operation to discharge. These Dams were not designed for rapid drawdown rates. Preliminary design documents indicate a rate of 6 inches or less a day was expected to be used. Typically, drawdown rates of up to 1 foot per day have been used for Rocky Flats dams, per recommendations for later Rocky Flats dams and the historical performance of these dams. The semipervious nature of the A-2 outer shell may provide capability for somewhat faster drawdown rates,

however, it is not a completely free draining material and the upstream slope is relatively steep, so that excessive drawdown rates are likely to cause, at a minimum, shallow localized upstream slope failures.

To prevent clogging and to facilitate later inspections, the pipe and outlet valves at some of the dams are a larger diameter than required for almost all operating conditions. Water release from the reservoirs should be such that the **drawdown rate is limited to 1 vertical foot per day**. Drawdown more rapid than one foot per day can effect the stability of the dam, resulting in slumps or landslides on the face of the dam. The semipervious nature of the outer shells, as well as the relative flatness of the slopes of A-3 and the Landfill Dam, may provide for drawdown rate capabilities in excess of 1 foot per day, however, they are not completely free draining materials and overly excessive drawdown rates may cause, at a minimum, shallow localized upstream slope failures. The valves on dams with operating outlets may only be fully opened when making water releases if the water level in the reservoir is quite low or the integrity of the dam is threatened. Extra capacity is generally available in the flumes in the event rapid evacuation of the reservoir pool becomes necessary. Maximum discharge through the outlet works should be restricted to emergency situations. Operating experience will indicate the maximum rate of outflow that can be maintained without undue downstream channel erosion. Key operating parameters for each reservoir, including: (1) stage, storage, and surface area, (2) outlet discharge rating curves, and (3) percent openings to limit drawdown to 1 foot per day, are given in the design drawings for each dam. Discharges should be monitored at least daily and the operations should be recorded on a log form similar to that included in the Appendices.

#### Unusual Conditions

Unusual conditions are defined as an occurrence not normally encountered in the routine operation of the dams and reservoirs which may endanger the dams or necessitate revision of the operating procedures. Floods or any evidence of riprap movement, surface cracking, or slope changes in the dams; any significant change in quantity or color of seepage flows from the dams, or any new damp spots or swampy areas that develop near the dams, any deflection of cutoff walls or pipe movements; any landslides or earthquakes; any structural damage or operational failures of equipment are examples of unusual conditions. When unusual conditions occur or are encountered during the routine operation of the dam and reservoir, operating personnel must immediately take appropriate precautionary and protective action and then report the conditions promptly. Reports should be made to the dam owner or their representative, or a higher authority, by the most rapid means of communication commensurate with the seriousness of the unusual condition. The *"Emergency Response Plan for Rocky Flats Dams"* is to be used to determine the appropriate "Action Level" and actions to be taken for unusual conditions.

Reports on any such unusual conditions should be accurate and as complete as possible. They should include at least: (1) a description of the unusual condition, (2) remedial measures taken or planned, (3) assistance that may be needed, and (4) an estimate of the probable duration of the unusual condition. Further developments, including the end of the unusual condition, should be described in follow-up reports. The follow-up report should be dispatched as soon as possible.

All reports should include measured information insofar as practical. Estimates by personnel untrained in handling unusual conditions can be unreliable and misleading. Reports should include the following:

1. Record of date and time of observations.
2. Measured location of unusual condition with respect to permanent landmarks or project features.
3. Measured extent of unusual condition, such as length and width of newly identified features.
4. Set stakes, measure seepage flow or otherwise quantify unusual conditions when first observed so that possible changes in area or flow rates can be evaluated later.
5. Take photographs if practicable. Place hard hat or other well known size standard in photograph to give scale.

If unusual conditions are such that downstream inhabitants or property owners will be, or are likely to be threatened, they should be warned. State and county law enforcement offices and local radio stations should be notified if it becomes apparent that reservoir releases may cause downstream flooding. The *"Emergency Response Plan for Rocky Flats Dams"* shall be used to determine the appropriate notifications and personnel that will make the notifications.

#### **MAINTENANCE AND INSPECTION INSTRUCTIONS**

A regular program of inspection and maintenance should be established and adhered to in order to properly maintain the project works. Regular observations are required to locate potential sources of trouble so that minor corrections and repairs can be made in time to prevent more serious deterioration or damage. Regular maintenance, consisting primarily of good housekeeping, is likewise essential to minimize the major causes of wear and deterioration of equipment and structures.

Instructions for inspections and maintenance, including a brief discussion of the procedures to be followed and a tabular Inspection and Maintenance Schedule, are attached in the Appendices. Detailed instructions and parts lists are given in manufacturers' manuals and bulletins for equipment where available. For convenient reference, the items of equipment and their respective suppliers are included in the List of References at the end of this section.

Each operator should become thoroughly familiar with the structures and equipment, and with all inspection and maintenance requirements and procedures. The operator has the responsibility of keeping the dams, outlet works, canals, and structures in good operating condition at all times. The operator will make all observations where the dismantling of equipment is not required, and will make all necessary adjustments and repairs that do not require skilled specialized personnel and facilities.

These instructions and the instructions contained in the manufacturers' literature are necessarily general. Experience in working with the structures and equipment may produce additional maintenance procedures or modification of the procedures contained herein. The operator is encouraged to suggest such changes, but they should be adopted only after careful consideration of their possible long-term effects, and after obtaining approval of an engineer who is thoroughly familiar with the design and function of the equipment and structures.

Water Level Staff Gauges of some type are present in all reservoirs except at Dams B-3, B-4, and C-1 since these operate as flow through structures. These staff gauges are I-beams with numbered face plates (A-4 and B-5), steel channels with numbered face plates (A-3), PVC pipe attached to t-posts with manually applied markings (C-2), or lathe with manually applied markings (A-1, A-2, B-1, B-2, and the Landfill Dam). At Dams A-3, A-4, B-1, B-3, B-5, C-2, and the Landfill Dam, a number of open well piezometers have been installed. The water level in the piezometers should be read monthly. A piezometer record sheet is included in the Appendices. Higher than normal piezometer levels should be reported immediately. Movement monuments have been installed on the crest of A-4, B-5, and C-2 which should be surveyed at least twice yearly by qualified surveyors and results reviewed by a qualified engineer. Inclinometers have also been installed at these dams, one at A-4, two each at B-5 and C-2, which should also be read by qualified personnel and results reviewed by a qualified engineer.

In addition to regular observations by operating personnel, an inspection by an engineer qualified in dam design and inspection should be conducted at least annually for A-3, A-4, B-5, C-2, and the Landfill Dam, in alternate years for A-1, A-2, B-1, B-2, B-3, B-4, or more often as special conditions arise. The frequency of periodic inspections may be increased by the engineer when conditions warrant. A yearly inspection of A-2, A-3, A-4, B-5, C-2, and the Landfill Dam is also performed by the Federal Energy Regulatory Commission (FERC).

#### Operating Records

Records on operation and maintenance of the dams must be accurate and current. A sample operations log form is presented in the Appendices. A record of precipitation, inflow volumes and reservoir level, both upon opening and closing the outlet valve, should be maintained. Operability of remote monitoring equipment should be checked periodically. If the remote monitoring equipment is non-operable, levels of reservoirs where inflow is occurring should generally be read weekly and monthly for all others. All observations and monitoring of the dams should be reported. Various record sheets are provided in the Appendices.

In addition to field records and logs, weekly status sheets are sent to the Dam Owner/the Department of Energy (DOE), the Colorado Department of Public Health and Environment (CDPHE), the downstream Cities of Broomfield and Westminster, and other interested parties. These status sheets are developed with a spreadsheet that has been specifically developed for pond operations.



### Dams and Reservoirs

The dam embankments, spillways, outlet works and reservoir shoreline should be inspected monthly, with general maintenance in the early spring and in the late fall. All debris found below the normal operating level should be raked up and removed to avoid the possibility of clogging the outlet works. A Weekly Observation Report form is included in the Appendices.

The riprap protection on the upstream slope of the dam should be inspected at times when the reservoir is drawn down to a minimum level, and after any major wind storm has produced prolonged wave action. The riprap should be maintained in good condition, and rock for repair can be obtained from the Asphalt Paving Company quarry or other quarries of equivalent quality. In cases where the bedding under the riprap has been removed by severe wave action, the bedding should be replaced prior to replacing the riprap. If erosion extends into the embankment beyond the riprap and bedding, the dam engineer should be notified immediately so arrangements for repair can be made promptly.

The dam embankments should be thoroughly inspected at least once a year after the season's major runoff event or events. When the reservoir levels reach their highest levels, the downstream slopes and abutments should be inspected for any new seepage, damp spots or swampy areas. In addition, the dams should be closely inspected for any evidence of surface cracking, settlement, or slope changes. In general, any condition that is changed from a previous inspection should be investigated.

### Spillways

A certain amount of erosion of the spillways can be expected to occur if a significant amount of water flows through the spillways. Every time a spillway flows, it should be checked for eroded areas. If the eroded areas extend only into the topsoil, the topsoil need only be replaced and seeded. If erosion is more significant and extends into the underlying soils or bedrock, repairs should be made with the approval of an engineer who is thoroughly familiar with the design and operation of similar structures. Trash or vegetation that might interfere with flow should be removed from the spillway channel.

### Outlet works

Every time the reservoirs are drained, the trashrack on the inlet structure should be inspected for accumulation of debris. If enough debris is present to cover approximately half of the area of the trashrack, it should be cleaned. Any large debris, such as logs or branches, should be removed immediately.

All valves should be operated for their full travel distances to insure proper internal lubrication every year. The outlet structure should be checked after each major flow for large rocks or logs that might be trapped in the structure and would interfere with normal operation. Cleaning sediment from the impact structure is generally not necessary as running water through the structure will clean it adequately.

The Parshall flume concrete should be checked yearly for any evidence of deterioration, cracking, or heaving, as should all exposed concrete surfaces. Sediment in the flume itself need not be cleaned out, but larger material should be removed. Trash or vegetation in the outlet channel that could interfere with flow should be removed.

#### Pipe Crossings and Diversion Dam Headworks

No regular maintenance is expected to be required for structures that use corrugated metal pipe. Inspections should be made after every major runoff event to insure that no large logs or branches are present that could plug the pipe inlets. Buildup of sediment in the pipes is normal and it is expected that during high flows water will clean the pipe adequately. If the pipes do become clogged because of abnormally large amounts of weeds or sediment, it will be necessary to clean the pipes. Movement of riprap or erosion of side overflows should be checked after a major runoff also.

#### Diversion Dams

The area immediately upstream of the diversion dams should be inspected every. All debris found within the normal floodplain that could plug the pipe inlets should be removed.

The riprap protection on the upstream and downstream slope of the diversion dams should be inspected after every major runoff event. The riprap shall be maintained in good condition, and rock for repair can be obtained from the Asphalt Paving Company quarry or other quarries of equivalent quality. In cases where the bedding material under the riprap has been damaged, the bedding material should be repaired prior to replacing the riprap.

The concrete pile cap should be checked yearly for any evidence of deterioration, cracking, or heaving.

Constructed upstream of the Walnut Creek Diversion Dam is a channel directing streamflow towards the headworks. The McKay Bypass pipeline is a concrete diversion structure and pipeline. The channels, as well as the headworks, should be inspected before the period flow is passed to Broomfield's water storage reservoir for debris that might interfere with the flow.

#### Canals

The canals should be inspected after every major runoff event. Problems that result from large accumulation of sediment or debris, slumps or slides along the canal, or movement of riprap on the drop structures should be corrected. Particular attention should be paid to the condition of the raised riprap control section at the upstream end of the rock grade controls. Materials may be piped from under rock grade controls by prolonged relatively minor flows in the canals; therefore, grade control structures should be inspected frequently, particularly in those reaches where the drops are close together. Any damage that could affect the structural integrity of the canal, such as cracks or seepage, should be investigated.

immediately. Trash or vegetation should be removed if the accumulation is sufficient to be a major impediment to normal flow.

APPENDIX 1 - DAM DATA

DAM NAME	D.O.E. ROCKY FLATS LF	D.O.E. ROCKY FLATS A-1	D.O.E. ROCKY FLATS A-2	D.O.E. ROCKY FLATS A-3	D.O.E. ROCKY FLATS A-4	D.O.E. ROCKY FLATS B-1	D.O.E. ROCKY FLATS B-2	D.O.E. ROCKY FLATS B-3	D.O.E. ROCKY FLATS B-4	D.O.E. ROCKY FLATS B-5	D.O.E. ROCKY FLATS C-1	D.O.E. ROCKY FLATS C-2
HAZARD CLASS	3	4	4	4	3	4	4	4	4	3	4	3
DAM TYPE	INTERMED.	MINOR	SMALL	SMALL	INTERMED.	MINOR	SMALL	MINOR	MINOR	SMALL	MINOR	SMALL
DAM ID	020413	025619	025620	020410	025621	025622	025623	025624	025625	025626	025627	025628
NAT ID	02341	02143	00973	02100	02243	02669	02670	02671	02672	02244	02673	02245
COUNTY	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON	JEFFERSON
SECTION	02	11	11	11	01	11	11	11	11	12	11	13
TOWNSHIP	2S	2S	2S	2S	2S	2S	2S	2S	2S	2S	2S	2S
RANGE	70W	70W	70W	70W	70W	70W	70W	70W	70W	70W	70W	70W
PRINCIPAL MERIDIAN	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH	SIXTH
DOWNSTREAM TOWN	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	BROOM-FIELD	WESTMINSTER	WESTMINSTER
DISTANCE TO TOWN DOWNSTREAM (MILES)	4	4	4	4	3	4	4	4	4	3	6	5
STREAM	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WALNUT CREEK	WOMAN CREEK	WOMAN CREEK
DAM TYPE	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)	RE (Earth)
DAM HEIGHT (ft)	40	17	27	33	40	16	24	16	16	48	15	32
DAM LENGTH (ft)	550	185	260	440	1100	200	225	135	200	525	250	1200
CREST WIDTH (ft)	18	18	36	20	20	30	26	25	25	20	25	20
CREST ELEVATION (ft)	5834.0	5833.6	5823.1	5799.0	5764.0	5885.0	5875.5	5856.8	5739.8	5810.4	5824.8	5775.3
SURFACE AREA (acres)	3	1	3	5	9	1	1	1	1	6	2	9
NORMAL STORAGE (af)	23	4	28	38	99	4	7	2	1	74	5	70
MAXIMUM STORAGE (af)	41	10	38	71	159	7	14	5	3	124	13	188
DRAINAGE BASIN AREA (acres)	128	884	916	953	983	103	113	123	134	320	1146	1619
MAX. OUTLET CAPACITY (cfs)	10	0	0	33	35	0	0	UNKNOWN	N/A	16	N/A	33
SPILLWAY TOTAL CAPACITY (cfs)	350	960	780	1200	6600	45	390	615	200	3500	1075	19100
SERVICE SPILLWAY TYPE	NONE	NONE	UCOND	NONE	NONE	NONE	UCOND	UCOND	UCHAN	NONE	UCHAN	NONE
SERVICE SPILLWAY CODE	NONE	NONE	OMP	NONE	NONE	NONE	HDPE	OMP	CONC	NONE	GROUT RCK	NONE
SERVICE SPWY WIDTH (ft)	NONE	NONE	4	NONE	NONE	NONE	2	2.9	7	NONE	30	NONE
SERVICE SPILLWAY FREEBOARD (ft)	NONE	NONE	6.2	NONE	NONE	NONE	6.6	5.1	4	NONE	5	NONE
SERVICE SPWY ELEV. (ft)	NONE	NONE	5816.9	NONE	NONE	NONE	5868.9	5851.7	5835.8	NONE	5823.3	NONE
EMER SPILLWAY TYPE	UCHAN	UCHAN	UCHAN	UCHAN	UCHAN	UCHAN	UCHAN	UCHAN	NONE	UCHAN	NONE	UCHAN
EMER SPILLWAY CODE	CONC	EARTH	EARTH	EARTH	EARTH	EARTH	EARTH	EARTH	NONE	EARTH	NONE	EARTH
EMER SPILLWAY WIDTH (ft)	8	20	20	20	150	18	10	10	NONE	80	NONE	250
EMER SPILLWAY FREEBOARD (ft)	5.3	4.5	2.9	6	6.1	3	4.8	5.1	NONE	6.5	NONE	10
EMER SPILLWAY ELEVATION (ft)	5921	5829.4	5820.2	5793.0	5757.9	5882.0	5870.7	5851.7	NONE	5803.9	NONE	5765

\*Values are from original design storm and dam configuration and are not current in all cases

[illegible]

APPENDIX 3 - MONTHLY OBSERVATION REPORT

Dam	Upstream Slope	Crest	Downstream Slope	Outlet	Spillway	Seepage	Displacements	Staff Gauge Reading	Issues and Description	Actions Taken
A-1										
A-2										
A-3										
A-4										
B-1										
B-2										
B-3										
B-4										
B-5										
C-1										
C-2										
Landfill										

Observer:

APPENDIX 4 – PIEZOMETER FIELD SHEET

Date:

Crew:

**Terminal Ponds**

**A-4**

	Crest DHA1	Crest A4-94-02	Crest A4-94-03	Toe DHA3	Toe A4-94-11	Toe A4-94-12
Casing Level	5765.18	5764.91	5766.43	5726.77	5737.28	5731.29
Field Measurement						
Water Level						

**B-5**

	Crest WH1	Crest WH2	Crest WH3	Crest B5-94-05	Crest B5-94-06	Toe WH4	Toe B5-94-11
Casing Level	5812.86	5812.61	5812.89	5813.23	5812.46	5765.42	5769.82
Field Measurement							
Water Level							

**C-2**

	Crest DHC1	Crest C2-94-02	Crest C2-94-03	Toe DHC2	Toe C2-94-11	Toe C2-94-12A	Toe C2-94-13A
Casing Level	5777.83	5777.84	5777.59	5745.92	5754.34	5749.24	5753.78
Field Measurement							
Water Level							

**Interior Ponds**

**A-3**

	Crest Piezo 1	Crest 46292	Toe Piezo 2	Toe 46492
Casing Level	5800.98	5801.64	5773.39	5773.88
Field Measurement				
Water Level				

**B-1**

	Crest 46592	Toe 46792
Casing Level	5888.14	5873.96
Field Measurement		
Water Level		

**B-3**

	Crest 46992	Toe 47092
Casing Level	5858.95	5844.17
Field Measurement		
Water Level		

**Landfill**

	Crest 47292	Toe 47492
Casing Level	5929.19	5894.19
Field Measurement		
Water Level		

APPENDIX 5 - FLUME RATINGS

A-4, B-5, AND C-2 TWO FOOT OUTLET FLUMES RATING

Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD	Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD	Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD
0.00	0.00	0	0.00	0.67	4.30	1930	2.78	1.34	12.59	5651	8.14
0.01	0.01	3	0.00	0.68	4.40	1975	2.84	1.35	12.74	5717	8.23
0.02	0.02	8	0.01	0.69	4.50	2020	2.91	1.36	12.88	5783	8.33
0.03	0.03	16	0.02	0.70	4.60	2066	2.97	1.37	13.03	5849	8.42
0.04	0.05	24	0.04	0.71	4.70	2112	3.04	1.38	13.18	5915	8.52
				0.72	4.81	2158	3.11	1.39	13.33	5982	8.61
0.06	0.10	46	0.07	0.73	4.91	2204	3.17	1.40	13.48	6048	8.71
0.07	0.13	58	0.08	0.74	5.02	2251	3.24	1.41	13.63	6116	8.81
0.08	0.16	72	0.10	0.75	5.12	2299	3.31	1.42	13.78	6183	8.90
0.09	0.19	86	0.12	0.76	5.23	2346	3.38	1.43	13.93	6250	9.00
0.10	0.23	101	0.15	0.77	5.34	2394	3.45	1.44	14.08	6318	9.10
0.11	0.26	117	0.17	0.78	5.44	2443	3.52	1.45	14.23	6387	9.20
0.12	0.30	134	0.19	0.79	5.55	2492	3.59	1.46	14.38	6455	9.30
0.13	0.34	152	0.22	0.80	5.66	2541	3.66	1.47	14.54	6524	9.39
0.14	0.38	170	0.25	0.81	5.77	2590	3.73	1.48	14.69	6592	9.49
0.15	0.42	190	0.27	0.82	5.88	2640	3.80	1.49	14.84	6662	9.59
0.16	0.47	210	0.30	0.83	5.99	2690	3.87	1.50	15.00	6731	9.69
0.17	0.51	230	0.33	0.84	6.11	2740	3.95	1.51	15.15	6801	9.79
0.18	0.56	252	0.36	0.85	6.22	2791	4.02	1.52	15.31	6871	9.89
0.19	0.61	274	0.39	0.86	6.33	2842	4.09	1.53	15.47	6941	10.00
0.20	0.66	296	0.43	0.87	6.45	2893	4.17	1.54	15.62	7011	10.10
0.21	0.71	320	0.46	0.88	6.56	2945	4.24	1.55	15.78	7082	10.20
0.22	0.77	343	0.49	0.89	6.68	2997	4.32	1.56	15.94	7153	10.30
0.23	0.82	368	0.53	0.90	6.79	3049	4.39	1.57	16.10	7224	10.40
0.24	0.88	393	0.57	0.91	6.91	3102	4.47	1.58	16.26	7296	10.51
0.25	0.93	419	0.60	0.92	7.03	3155	4.54	1.59	16.42	7367	10.61
0.26	0.99	445	0.64	0.93	7.15	3208	4.62	1.60	16.58	7439	10.71
0.27	1.05	472	0.68	0.94	7.27	3262	4.70	1.61	16.74	7511	10.82
0.28	1.11	499	0.72	0.95	7.39	3316	4.78	1.62	16.90	7584	10.92
0.29	1.17	527	0.76	0.96	7.51	3370	4.85	1.63	17.06	7657	11.03
0.30	1.24	555	0.80	0.97	7.63	3425	4.93	1.64	17.22	7729	11.13
0.31	1.30	584	0.84	0.98	7.75	3480	5.01	1.65	17.39	7803	11.24
0.32	1.37	614	0.88	0.99	7.88	3535	5.09	1.66	17.55	7876	11.34
0.33	1.43	644	0.93	1.00	8.00	3590	5.17	1.67	17.71	7950	11.45
0.34	1.50	674	0.97	1.01	8.12	3646	5.25	1.68	17.88	8024	11.55
0.35	1.57	705	1.02	1.02	8.25	3702	5.33	1.69	18.04	8098	11.66
0.36	1.64	737	1.06	1.03	8.38	3759	5.41	1.70	18.21	8172	11.77
0.37	1.71	769	1.11	1.04	8.50	3815	5.49	1.71	18.38	8247	11.88
0.38	1.79	801	1.15	1.05	8.63	3872	5.58	1.72	18.54	8322	11.98
0.39	1.86	834	1.20	1.06	8.76	3930	5.66	1.73	18.71	8397	12.09
0.40	1.93	868	1.25	1.07	8.88	3987	5.74	1.74	18.88	8472	12.20
0.41	2.01	901	1.30	1.08	9.01	4045	5.83	1.75	19.05	8548	12.31
0.42	2.09	936	1.35	1.09	9.14	4103	5.91	1.76	19.21	8624	12.42
0.43	2.16	971	1.40	1.10	9.27	4162	5.99	1.77	19.38	8700	12.53
0.44	2.24	1006	1.45	1.11	9.40	4221	6.08	1.78	19.55	8776	12.64
0.45	2.32	1041	1.50	1.12	9.54	4280	6.16	1.79	19.72	8852	12.75
0.46	2.40	1078	1.55	1.13	9.67	4339	6.25	1.80	19.90	8929	12.86
0.47	2.48	1114	1.60	1.14	9.80	4399	6.33	1.81	20.07	9006	12.97
0.48	2.56	1151	1.66	1.15	9.94	4459	6.42	1.82	20.24	9084	13.08
0.49	2.65	1188	1.71	1.16	10.07	4519	6.51	1.83	20.41	9161	13.19
0.50	2.73	1226	1.77	1.17	10.20	4580	6.59	1.84	20.59	9239	13.30
0.51	2.82	1264	1.82	1.18	10.34	4640	6.68	1.85	20.76	9317	13.42
0.52	2.90	1303	1.88	1.19	10.48	4702	6.77	1.86	20.93	9395	13.53
0.53	2.99	1342	1.93	1.20	10.61	4763	6.86	1.87	21.11	9473	13.64
0.54	3.08	1382	1.99	1.21	10.75	4825	6.95	1.88	21.28	9552	13.76
0.55	3.17	1421	2.05	1.22	10.89	4887	7.04	1.89	21.46	9631	13.87
0.56	3.26	1462	2.10	1.23	11.03	4949	7.13	1.90	21.64	9710	13.98
0.57	3.35	1502	2.16	1.24	11.17	5011	7.22	1.91	21.81	9789	14.10
0.58	3.44	1543	2.22	1.25	11.31	5074	7.31	1.92	21.99	9869	14.21
0.59	3.53	1585	2.28	1.26	11.45	5137	7.40	1.93	22.17	9948	14.33
0.60	3.62	1627	2.34	1.27	11.59	5200	7.49	1.94	22.35	10028	14.44
0.61	3.72	1669	2.40	1.28	11.73	5264	7.58	1.95	22.52	10109	14.56
0.62	3.81	1711	2.46	1.29	11.87	5328	7.67	1.96	22.70	10189	14.67
0.63	3.91	1754	2.53	1.30	12.01	5392	7.76	1.97	22.88	10270	14.79
0.64	4.01	1798	2.59	1.31	12.16	5456	7.86	1.98	23.06	10351	14.91
0.65	4.10	1841	2.65	1.32	12.30	5521	7.95	1.99	23.24	10432	15.02
0.66	4.20	1886	2.72	1.33	12.45	5586	8.04	2.00	23.43	10513	15.14



APPENDIX 5 – FLUME RATINGS (continued)

A-3 TWO AND ONE HALF FOOT OUTLET FLUMES RATING

Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD	Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD	Gauge Reading (ft)	Flow CFS	Flow GPM	Flow MGD
0.00	0.00	0.00	0.00	0.73	6.12	2748	3.96	1.37	16.33	7331	10.56
0.10	0.28	124	0.18	0.74	6.25	2807	4.04	1.38	16.52	7414	10.68
0.11	0.32	144	0.21	0.75	6.39	2866	4.13	1.39	16.71	7498	10.80
0.12	0.37	165	0.24	0.76	6.52	2926	4.21	1.40	16.90	7583	10.92
0.13	0.42	187	0.27	0.77	6.65	2986	4.30	1.41	17.08	7667	11.04
0.14	0.47	209	0.30	0.78	6.79	3047	4.39	1.42	17.27	7752	11.16
0.15	0.52	233	0.34	0.79	6.93	3108	4.48	1.43	17.46	7837	11.29
0.16	0.57	258	0.37	0.80	7.06	3170	4.56	1.44	17.65	7923	11.41
0.17	0.63	284	0.41	0.81	7.20	3232	4.65	1.45	17.85	8009	11.53
0.18	0.69	310	0.45	0.82	7.34	3294	4.74	1.46	18.04	8095	11.66
0.19	0.75	337	0.49	0.83	7.48	3357	4.83	1.47	18.23	8182	11.78
0.20	0.81	365	0.53	0.84	7.62	3420	4.93	1.48	18.42	8269	11.91
0.21	0.88	394	0.57	0.85	7.76	3484	5.02	1.49	18.62	8356	12.03
0.22	0.94	424	0.61	0.86	7.91	3548	5.11	1.50	18.81	8444	12.16
0.23	1.01	454	0.65	0.87	8.05	3612	5.20	1.51	19.01	8531	12.29
0.24	1.08	485	0.70	0.88	8.19	3677	5.30	1.52	19.21	8620	12.41
0.25	1.15	517	0.74	0.89	8.34	3743	5.39	1.53	19.40	8708	12.54
0.26	1.22	550	0.79	0.90	8.49	3808	5.48	1.54	19.60	8797	12.67
0.27	1.30	583	0.84	0.91	8.63	3874	5.58	1.55	19.80	8886	12.80
0.28	1.37	617	0.89	0.92	8.78	3941	5.68	1.56	20.00	8976	12.93
0.29	1.45	652	0.94	0.93	8.93	4008	5.77	1.57	20.20	9066	13.06
0.30	1.53	687	0.99	0.94	9.08	4075	5.87	1.58	20.40	9156	13.18
0.31	1.61	723	1.04	0.95	9.23	4143	5.97	1.59	20.60	9246	13.32
0.32	1.69	760	1.09	0.96	9.38	4211	6.06	1.60	20.80	9337	13.45
0.33	1.78	797	1.15	0.97	9.54	4280	6.16	1.61	21.01	9428	13.58
0.34	1.86	835	1.20	0.98	9.69	4349	6.26	1.62	21.21	9520	13.71
0.35	1.95	874	1.26	0.99	9.84	4418	6.36	1.63	21.42	9611	13.84
0.36	2.03	913	1.31	1.00	10.00	4488	6.46	1.64	21.62	9703	13.97
0.37	2.12	953	1.37	1.01	10.16	4558	6.56	1.65	21.83	9796	14.11
0.38	2.21	993	1.43	1.02	10.31	4629	6.67	1.66	22.03	9889	14.24
0.39	2.30	1034	1.49	1.03	10.47	4700	6.77	1.67	22.24	9982	14.37
0.40	2.40	1076	1.55	1.04	10.63	4771	6.87	1.68	22.45	10075	14.51
0.41	2.49	1118	1.61	1.05	10.79	4843	6.97	1.69	22.66	10169	14.64
0.42	2.59	1161	1.67	1.06	10.95	4915	7.08	1.70	22.87	10262	14.78
0.43	2.68	1204	1.73	1.07	11.11	4987	7.18	1.71	23.08	10357	14.91
0.44	2.78	1248	1.80	1.08	11.27	5060	7.29	1.72	23.29	10451	15.05
0.45	2.88	1293	1.86	1.09	11.44	5133	7.39	1.73	23.50	10546	15.19
0.46	2.98	1338	1.93	1.10	11.60	5207	7.50	1.74	23.71	10641	15.32
0.47	3.08	1383	1.99	1.11	11.77	5281	7.60	1.75	23.92	10737	15.46
0.48	3.19	1430	2.06	1.12	11.93	5355	7.71	1.76	24.14	10833	15.60
0.49	3.29	1476	2.13	1.13	12.10	5430	7.82	1.77	24.35	10929	15.74
0.50	3.39	1523	2.19	1.14	12.27	5505	7.93	1.78	24.57	11025	15.88
0.51	3.50	1571	2.26	1.15	12.43	5580	8.04	1.79	24.78	11122	16.02
0.52	3.61	1620	2.33	1.16	12.60	5656	8.15	1.80	25.00	11219	16.16
0.53	3.72	1668	2.40	1.17	12.77	5732	8.25	1.81	25.21	11316	16.30
0.54	3.83	1718	2.47	1.18	12.94	5809	8.37	1.82	25.43	11414	16.44
0.55	3.94	1767	2.55	1.19	13.11	5886	8.48	1.83	25.65	11512	16.58
0.56	4.05	1818	2.62	1.20	13.29	5963	8.59	1.84	25.87	11610	16.72
0.57	4.16	1869	2.69	1.21	13.46	6041	8.70	1.85	26.09	11708	16.86
0.58	4.28	1920	2.76	1.22	13.63	6119	8.81	1.86	26.31	11807	17.00
0.59	4.39	1972	2.84	1.23	13.81	6197	8.92	1.87	26.53	11906	17.15
0.60	4.51	2024	2.92	1.24	13.98	6276	9.04	1.88	26.75	12005	17.29
0.61	4.63	2077	2.99	1.25	14.16	6355	9.15	1.89	26.97	12105	17.43
0.62	4.75	2130	3.07	1.26	14.34	6434	9.27	1.90	27.20	12205	17.58
0.63	4.87	2184	3.15	1.27	14.51	6514	9.38	1.91	27.42	12305	17.72
0.64	4.99	2238	3.22	1.28	14.69	6594	9.50	1.92	27.64	12406	17.87
0.65	5.11	2293	3.30	1.29	14.87	6675	9.61	1.93	27.87	12507	18.01
0.66	5.23	2348	3.38	1.30	15.05	6755	9.73	1.94	28.09	12608	18.16
0.67	5.36	2404	3.46	1.31	15.23	6837	9.85	1.95	28.32	12709	18.30
0.68	5.48	2460	3.54	1.32	15.41	6918	9.96	1.96	28.55	12811	18.45
0.69	5.61	2517	3.62	1.33	15.60	7000	10.08	1.97	28.77	12913	18.60
0.70	5.74	2574	3.71	1.34	15.78	7082	10.20	1.98	29.00	13016	18.74
0.71	5.86	2632	3.79	1.35	15.96	7165	10.32	1.99	29.23	13118	18.89
0.72	5.99	2690	3.87	1.36	16.15	7248	10.44	2.00	29.46	13221	19.04

APPENDIX 6 – INSPECTION AND MAINTENANCE SCHEDULE

ROCKY FLATS SURFACE WATER CONTROL

Item	Regular Observation		Periodic Maintenance	
	Frequency	Procedure	Frequency	Procedure
<b>Dams and Reservoirs</b>				
Shoreline	Monthly	Inspect shoreline	Yearly	Dispose of large debris at time of low water
Riprap	Monthly and at minimum reservoir level and after major wind storms	Inspect for displaced riprap areas	Not scheduled	Replace or repair riprap if bedding is competent, otherwise report to engineer
Embankment	Monthly and at maximum reservoir level and after major runoff	Inspect visually for embankment movement, seepage, or surface erosion	Not scheduled	Report to engineer
Spillways	After use	Inspect for eroded areas	Not scheduled	Repair if localized to topsoil or report to engineer
Piezometers	Monthly	Read and record	Not scheduled	Report to engineer
Movement Markers and Inclinometers	Twice Yearly (June and December)	Survey/Read	Not scheduled	Report to engineer
<b>Outlet Works</b>				
Trashrack	When Reservoir is drained	Inspect for debris	Not scheduled	Clean accumulations of debris
Gates and Valves	Monthly	Inspect visually	Yearly	Operate valves through full travel and lubricate
Outlet Structure	Monthly and after use	Inspect for large debris	Not scheduled	Remove large debris
Parshall Flume	Monthly and after use	Inspect for large debris	Not scheduled	Remove large debris
All concrete	Yearly	Inspect visually for deterioration	Not scheduled	Report to engineer
Pipe Crossings and Headworks	After major runoff	Inspect for large debris or movement of riprap	Not scheduled	Remove large debris and repair or replace riprap
<b>Diversion Dams</b>				
Upstream Floodplain	Yearly	Inspect for large debris	Not scheduled	Remove large debris
Riprap	After major runoff	Inspect for large debris	Not scheduled	Replace or repair riprap if bedding is competent; otherwise report to engineer
Concrete Cap	Yearly	Inspect visually for deterioration	Not scheduled	Report to engineer
<b>Canals</b>				
Channels	After major runoff	Inspect for large debris	Not scheduled	Remove large debris
Embankments	Yearly	Inspect visually for movement or seepage	Not scheduled	Report to engineer
Rock Grade Controls	After major runoff	Inspect for riprap movement	Not scheduled	Repair or replace riprap if bedding is competent

APPENDIX 7 - REFERENCES

CONTRACT DRAWINGS - TERMINAL DAMS		
SHEET	DWG NO.	TITLE
1	27165-201	TITLESHEET AND DRAWING INDEX
2	27165-202	LOCATION PLAN
3	27165-203	DRAINAGE AREAS
4	27165-210	A-4 DAM DRAWING INDEX
5	27165-211	A-4 DAM GENERAL PLAN
6	27165-212	A-4 DAM CUTOFF TRENCH PLAN AND DAM PROFILE
7	27165-213	A-4 DAM LOGS OF EXPLORATIONS - DAM PROFILE
8	27165-214	A-4 DAM LOGS OR EXPLORATIONS
9	27165-215	A-4 DAM EMBANKMENT AND SPILLWAY DETAILS
10	27165-216	A-4 DAM OUTLET WORKS
11	27165-220	B-5 DAM DRAWING INDEX
12	27165-221	B-5 DAM GENERAL PLAN
13	27165-222	B-5 DAM CUTOFF TRENCH PLAN AND DAM PROFILE
14	27165-223	B-5 DAM LOGS OF EXPLORATIONS
15	27165-224	B-5 DAM EMBANKMENT AND SPILLWAY DETAILS
16	27165-225	B-5 DAM OUTLET WORKS
17	27165-230	C-2 DAM DRAWING INDEX
18	27165-231	C-2 DAM GENERAL PLAN
19	27165-232	C-2 DAM CUTOFF TRENCH PLAN AND DAM PROFILE
20	27165-233	C-2 DAM LOGS OF EXPLORATIONS - DAM PROFILE
21	27165-234	C-2 DAM LOGS OR EXPLORATIONS
22	27165-235	C-2 DAM EMBANKMENT AND SPILLWAY DETAILS
23	27165-236	C-2 DAM OUTLET WORKS
24	27165-240	AREA MAP - A-4 AND B-5 DAMS
25	27165-241	OUTLET WORKS - INLET STRUCTURE AND PIPE DETAILS
26	27165-242	OUTLET WORKS - OUTLET STRUCTURE
27	27165-243	PARSHALL FLUME
28	27165-244	ACCESS ROADS
29	27165-251	DIVERSION DAMS AND BYPASS AND INTERCEPTOR CANALS - INDEX PLAN
30	27165-252	WEST INTERCEPTOR CANAL STA 0+00 TO STA 7+83.80 - PLAN AND PROFILE
31	27165-253	WEST INTERCEPTOR CANAL STRUCTURES
32	27165-254	WALNUT CREEK DIVERSION DAM - GENERAL PLAN AND SECTION
33	27165-255	WALNUT CREEK DIVERSION DAM - SECTIONS
34	27165-256	McKAY BYPASS CANAL STA 0+00 TO STA 11+75 - PLAN AND PROFILE
35	27165-257	McKAY BYPASS CANAL STA 11+75 TO STA 27+00 - PLAN AND PROFILE
36	27165-258	McKAY BYPASS CANAL STA 27+00 TO STA 41+00 - PLAN AND PROFILE
37	27165-259	McKAY BYPASS CANAL STA 41+00 TO STA 55+00 - PLAN AND PROFILE
38	27165-260	McKAY BYPASS CANAL STA 55+00 TO STA 69+00 - PLAN AND PROFILE

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39	27165-261	McKAY BYPASS CANAL STA 69+00 TO STA 84+25 - PLAN AND PROFILE
40	27165-262	MCKAY BYPASS CANAL STA 84+25 TO STA 99+25 - PLAN AND PROFILE
41	27165-263	McKAY BYPASS CANAL STA 99+25 to STA 105+00.04 - PLAN AND PROFILE
42	27165-264	SIDE SPILLWAY AND ROAD CROSSING AT STA 9+60.41 McKAY BYPASS CANAL
43	27165-265	ROAD CROSSING AT STA 103+85 McKAY BYPASS CANAL
44	27165-266	WOMAN CREEK DIVERSION DAM - GENERAL PLAN AND SECTION
45	27165-267	WOMAN CREEK DIVERSION DAM - SECTIONS
46	27165-268	WOMAN CREEK :BYPASS CANAL STA 0+00 TO STA 12+00 - PLAN AND PROFILE
47	27165-269	WOMAN CREEK BYPASS CANAL STA 12-F00 TO STA 20.64.71 - PLAN AND PROFILE
48	27165-270	SOUTH INTERCEPTOR CANAL STA 0+00 TO STA 12+00 - PLAN AND PROFILE
48A	27165-292	SOUTH INTERCEPTOR CANAL PIPE DRAIN STA 9+71 - LOCATION PLAN
49	27165-271	SOUTH INTERCEPTOR CANAL STA 12+00 TO STA 25+00 - PLAN AND PROFILE
50	27165-272	SOUTH INTERCEPTOR CANAL STA 25+00 TO SIR 37+00 - PLAN AND PROFILE
50A	27165-293	SOUTH INTERCEPTOR PIPE DRAIN STA 29+52 - LOCATION PLAN
51	27165-273	SOUTH INTERCEPTOR CANAL STA 37+00 TO STA 99+00 PLAN AND PROFILE
52	27165-274	SOUTH INTERCEPTOR CANAL STA 49+00 TO STA 63+50 - PLAN AND PROFILE
53	27165-275	SOUTH INTERCEPTOR CANAL STA 63+50 TO STE 79+45 - PLAN AND PROFILE
54	27165-276	ROAD CROSSING AT STA 15+22 SOUTH INTERCEPTOR CANAL
55	27165-277	ROAD CROSSING AT STA 53+03.18 SOUTH INTERCEPTOR CANAL
56	27165-278	ROAD CROSSING AT STA 69+25 SOUTH INTERCEPTOR CANAL
57	27165-279	WOMAN CREEK CANAL CROSSING AT STA 76+70.13 SOUTH INTERCEPTOR CANAL
58	27165-285	TYPICAL CANAL SECTIONS
59	27165-286	TYPICAL ROCK GRADE CONTROL
60	27165-287	DIVERSION DAMS AND BYPASS AND INTERCEPTOR CANALS - LOGS OF EXPLORATIONS
61	27165-288	SURVEY CONTROL
61A	27165-289	EROSION PROTECTION - McKAY BYPASS CHANNEL OUTFALL TO WALNUT CREEK
61B	27165-299	EROSION PROTECTION - McKAY BYPASS CHANNEL OUTFALL TO WALNUT CREEK
61C	27165-295	EROSION PROTECTION - McKAY BYPASS CHANNEL OUTFALL TO WALNUT CREEK
61D	27165-296	EROSION AND SLIDE REPAIR - SOUTH INTERCEPTOR CANAL, McKAY DITCH DIVERSION
61E	27165-297	EROSION 7 SLEDS REPAIR - PROTECTION OF COORS NATURAL GAS LINE
61E	27165-298	EROSION 7 SLIDE REPAIR - McKAY BYPASS CANAL

61G	27165-299	EROSION 7 SLIDE REPAIR - McKAY BYPASS CANDY. SURFACE & SUBSURFACE DRAINAGE
62	27165-103	TOPSOIL REMOVAL - A-4 DAM SITE TEST PLOT
63	27165-104	TOPSOIL REMOVAL - C-2 DAM SITE
64	27165-105	TOPSOIL REMOVAL - SOUTH INTERCEPTOR CANAL
65	27165-106	TOPSOIL REMOVAL - SOUTH INTERCEPTOR CANAL
66	27165-107	TOPSOIL REMOVAL - WOMAN CREEK DIVERSION DAM AND BYPASS CANAL
67	27165-108	TOPSOIL REMOVAL - WOMAN CREEK BYPASS CANAL
68	27165-290	LOCATION OF COORS GAS LINE
69	27165-291	SOUTH INTERCEPTOR CANAL - PIPE DRAIN AT STA 9+71 AND STA 29+52

<b>CONTRACT DRAWINGS - A-3 DAM</b>		
1	27038-1	TITLE SHEET
2	27038-2	LOCATION MAP AND LOG OF BORINGS
3	27038-3	EARTHWORK PLAN AND DETAILS
4	27038-4	STORM DRAIN BYPASS PIPELINE
5	27038-5	OUTLET STRUCTURE AND STILLING BASIN
6	27038-6	EMBANKMENT CROSS SECTIONS
7	27038-7	EMBANKMENT CROSS SECTIONS
8	27038-8	EMBANKMENT CROSS SECTIONS
9	27038-9	EMBANKMENT CROSS SECTIONS
10	27038-10	SPILLWAY CROSS SECTIONS

<b>CONTRACT DRAWINGS - LANDFILL DAM</b>		
7	27318-1	GENERAL PLAN-DAM AND RESERVOIR
8	27318-2	PLAN, PROFILE AND SECTIONS-DAM
9	27318-3	SPILLWAY AND OUTLET-PLAN
10	27318-4	SPILLWAY AND OUTLET-DETAILS
11	27318-5	TEST BORING AND PIT LOCATION PLAN
12	27318-6	LOGS OF EXPLORATORY BORINGS AND TEST PITS

<b>CONTRACT DRAWINGS - INTERIOR DAMS</b>		
1	24961-1	TITLE SHEET
2	24961-2	SITE PLAN
3	24961-3	SOILS LOG AND LOCATION MAP
4	24961-4	SOILS LOG AND LOCATION MAP
5	24961-5	POND MODIFICATION PLAN ON NORTH WALNUT CREEK
6	24961-6	DIVERSION STRUCTURE DETAILS NORTH WALNUT CREEK
7	24961-7	PROFILE AND DETAILS OF 42" DIVERSION PIPE NORTH WALNUT CREEK
8	24961-8	OVERFLOW STRUCTURE AND OUTLET GATE DETAILS NORTH WALNUT CREEK
9	24961-9	POND MODIFICATION PLAN ON SOUTH WALNUT CREEK
10	24961-10	POND MODIFICATION PLAN ON SOUTH WALNUT CREEK
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6	28895-006	INLET STRUCTURE DETAILS
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8	28895-008	DAM CROSS SECTIONS
9	28895-009	DAM CROSS SECTIONS
10	28895-010	DAM CROSS SECTIONS
11	28895-011	DAM CROSS SECTIONS
12	28895-012	DAM CROSS SECTIONS
13	28895-013	DAM CROSS SECTIONS
14	28895-014	DAM CROSS SECTIONS
15	28895-015	DAM CROSS SECTIONS
16	28895-016	DETAILS OF TEMPORARY COFFERDAM

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6	39873-004	CAPACITY CHART POND A1
7	39873-005	CAPACITY CHART POND A2
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2	51420-0002	RFETS SITE MAP AND CONSTRUCTION ACCESS
3	51420-0003	EXISTING A-4 POND AND COFFERDAM DETAILS
4	51420-0004	A-4 DAM SITE PLAN AND DETAILS
5	51420-0005	OUTLET WORKS PLAN AND PROFILE
6	51420-0006	PLAN AND PROFILE OF INTAKE
7	51420-0007	MAIN GATE DETAILS
8	51420-0008	WATER QUALITY GATE DETAILS
9	51420-0009	GATE STEM DETAILS
10	51420-0010	STAFF GAGE DETAILS
11	51420-0011	OUTLET WORKS DISCHARGE TABLES AND CURVES

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2	51420-0022	SITE MAP AND CONSTRUCTION ACCESS
3	51420-0023	EXISTING B-5 POND
4	51420-0024	B-5 DAM SITE PLAN AND DETAILS
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6	51420-0026	INTAKE TOWER MODIFICATION
7	51420-0027	WATER QUALITY GATE DETAILS
8	51420-0028	GATE OPERATOR DETAILS
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<b>C-2 DAM OUTLET MODIFICATIONS</b>		
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2	51420-0052	SITE MAP, ABBREVIATIONS, AND CONSTRUCTION ACCESS
3	51420-0053	GENERAL SITE PLAN
4	51420-0054	DETAILS
5	51420-0055	STRUCTURAL PLANS AND DETAILS
6	51420-0056	RESERVOIR AND OUTLET WORKS TABLES AND CURVES

<b>A-1 AND B-2 OUTLET MODIFICATIONS</b>		
1	51505-0001	AREA PLOT PLAN AND DAM A-1 MODIFICATIONS
2	51505-0002	DAM B-2 OUTLET MODIFICATIONS
3	51505-0003	SECTION AND DETAILS DAM A-1 AND B-2 OUTLET MODIFICATIONS

**OPERATIONS AND MAINTENANCE INSTRUCTIONS  
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4	51505-0004	SECTION AND DETAILS DAM B-2 OUTLET MODIFICATIONS
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**McKAY BYPASS EXTENSION**

1	51560-0001	TITLE SHEET AND LOCATION MAP
2	51560-0002	PIPELINE PLAN AND PROFILE STA. 10+00 TO 23+75
3	51560-0003	PIPELINE PLAN AND PROFILE STA. 23+75 TO 37+75
4	51560-0004	PIPELINE PLAN AND PROFILE STA. 37+75 TO 49+18
5	51560-0005	MISCELLANEOUS DETAILS
6	51560-0006	DIVERSION STRUCTURE
7	51560-0007	DIVERSION STRUCTURE DETAILS - SHEET 1
8	51560-0008	DIVERSION STRUCTURE DETAILS - SHEET 2

**C-1 DAM MODIFICATIONS**

1	51560-0101	TITLE SHEET AND DRAWING INDEX
2	51560-0102	SITE PLAN
3	51560-0103	BREACH PLAN
4	51560-0104	BREACH DETAILS AND SPILLWAY GRADING
5	51560-0105	DETAILS AND SECTIONS

**REFERENCE REPORTS**

DATE	TITLE
June 1971	Soils Investigation for INCREASED WATER RETENTION
June 1974	SUBSURFACE STUDIES SANITARY LANDFILL RENOVATIONS
June 1974	Title I Report for SANITARY LANDFILL RENOVATIONS
July 1977	DAM SITES INVESTIGATION
May 1978	Title I Report for SURFACE WATER CONTROL
October 24, 1978	SPECIFICATIONS FOR SURFACE WATER CONTROL
March 26, 1984	STABILITY EVALUATION - DAM B-5
August 1984	MCCALL-ELLINGSON & MORILL AND REVISED BY WOODWARD-CLYDE CONSULTANTS AND MERRICK & COMPANY, OPERATIONS AND MAINTENANCE INSTRUCTIONS FOR ROCKY FLATS SURFACE WATER CONTROL PROJECTS (DAMS AND RESERVOIRS)
February 1996	TECHNICAL SPECIFICATIONS A-4 DAM OUTLET MODIFICATIONS ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
February 1996	DESIGN BASIS DOCUMENT A-4 DAM OUTLET MODIFICATIONS ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
August 1997	TECHNICAL SPECIFICATIONS B-5 AND C-2 DAM OUTLET MODIFICATIONS ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE



August 1997	DESIGN BASIS DOCUMENT B-5 AND C-2 DAM OUTLET MODIFICATIONS ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
March 1998	SUPPLEMENT TO OPERATIONS AND MAINTENANCE - INSTRUCTIONS FOR ROCKY FLATS SURFACE WATER CONTROL PROJECT (DAMS AND RESERVOIRS)
December 2004	WRIGHT WATER ENGINEERS DETERMINATION OF PEAK FLOW DAMS A-1, A-2, B-1, B-2, B-3, B-4, AND C-1
June 2005	DESIGN REPORT FOR C-2 OUTLET MODIFICATIONS, CH2MHILL

**CONTRACTORS AND MAJOR SUPPLY COMPANIES**

General Contractor- Surface Water Control  
Kirkland Trenching & Excavation  
Star Route 5, Box 354  
Rye, Colorado 81069

Concrete Subcontractor  
Clemons Construction Corp.  
8160 West Fremont Avenue  
Littleton, Colorado 80123

Seeding Subcontractor  
Geisman Seeding Company  
Route 1, P.O. Box 237  
Longmont, Colorado 80501

General Contractor (1984)  
Kemp-Hoffman  
11445 Riverdale Road  
Northglenn, Colorado 80233

The major supply companies used for the 1984 construction work on Dam B-5 include:

Dam B-5 Inlet Structure Access Lid  
Commerce City Supply (1984)  
7302 Ivanhoe  
Commerce City, Colorado 80022

Concrete  
Mobile-Premix Concrete, Inc.  
1500 West 12th Avenue  
Denver, Colorado 80217

18" Outlet Pipe  
Interpace Corp.  
P.O. Box 2233  
Kansas City, Missouri 64142

Riprap  
Asphalt Paving Company  
14802 West 44th Avenue  
Golden, Colorado 80401

Reinforcing Steel  
Rio Grande Company  
123 Santa Fe Drive  
Denver, Colorado 80223

Riprap Bedding - Dam B-5 (1984)  
Albert Frei and Sons Sand and Gravel  
11521 Brighton Boulevard  
Northglenn, Colorado 80690

Outlet Valves and Miscellaneous Metals  
Pipe Service, Inc.  
2201 South Valentia Street  
Denver, Colorado 80231

Coherex  
Colorado Bitumuls Co., Inc.  
5301 North Bannock, P.O. Box 175  
Denver, Colorado 80201

Kemp-Hoffman - Dam B-5 (1984)  
11445 Riverdale Road  
Northglenn, Colorado 80233

Steel Sheet Piling  
United States Steel Corporation  
South Works  
Chicago, Illinois 60617

CMP, Gauge Houses, Parshall Flumes,  
Recorders

Armco, Inc.  
Metal Products Div.  
P.O. Bo, 5685  
Denver, Colorado 80217

6" 0 Class 200 PVC Slotted Well  
Casing - Dam B-5 (1994)  
Reeves Plastic Pipe Co., Inc  
4295 Kearney Street  
Denver, Colorado 80216

Dam B-5 6" 0 Gate Valve and  
Stem Guides - Dam H-5 (1984)  
Pipeline Materials, Inc.  
4150 Elati  
Littleton, Colorado 80120

A-4 and B-5 Dam Outlet Modifications

General Contractor:  
Parker Xcavating, Inc.  
5800 Franklin Street  
Suite 202A  
Denver, Colorado 80216

The major supply companies used for A-4 and B-5 Dam construction work include:

Slide Gates:  
HydroGate  
6101 Dexter Street  
Englewood, Colorado 80110

Drain Valve:  
Flo-Controls, Inc.  
4242 South Broadway  
Commerce City, Colorado 80022

Steel Piping System  
Waterworks Sales Company  
4295 Kearney Street  
Denver, Colorado 80216

Fabricated Steel:  
Davo Steel Fabrication  
3844 S. Kalamath  
Englewood, Colorado 80110

Reinforcing Steel:  
Rio Grande Co.  
P.O. Box 17227  
Denver, Colorado 80217

Staff Gages (Leopold & Stevens):  
Contech Construction Material  
4891 Independence Street  
Wheat Ridge, Colorado 80033

Bedding:  
Mobile-Premix  
1400 West 64th Avenue  
P.O. Box 215001  
Denver, Colorado 80221-0599

Cofferdam Fill:  
Western Aggregates  
11728 Highway 93  
Boulder, Colorado 80303  
Denver, Colorado 80221-0599

Stem Encasement Oil:  
Fleishli Oil Company  
6170 East 49th Avenue  
Commerce City, CO 80022  
(Univis Bio 40)

Concrete:  
Suburban Reddi-Mix Company  
5400 Fenton Street  
Arvada, CO 80002  
(Univis Bio 40)

Riprap:  
Western Aggregates  
11728 Highway 93  
Boulder, CO 80303

APPENDIX 8 – CAPACITY CHARTS

POND A-4 Spillway Crest: 5757.9' Dam Crest: 5764.0'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5727.0	0.00	0.0%
5728.0	0.00	0.0%
5729.0	0.00	0.0%
5730.0	0.00	0.0%
5731.0	0.01	0.0%
5732.0	0.04	0.1%
5733.0	0.13	0.4%
5734.0	0.28	0.9%
5735.0	0.49	1.5%
5736.0	0.74	2.3%
5737.0	1.05	3.3%
5738.0	1.43	4.5%
5739.0	1.90	5.9%
5740.0	2.45	7.6%
5741.0	3.10	9.7%
5742.0	3.87	12.1%
5743.0	4.76	14.8%
5744.0	5.76	17.9%
5745.0	6.86	21.3%
5746.0	8.07	25.1%
5747.0	9.39	29.2%
5748.0	10.82	33.7%
5749.0	12.37	38.5%
5750.0	14.04	43.7%
5751.0	15.86	49.4%
5751.1	16.06	50.0%
5752.0	17.83	55.5%
5753.0	19.91	62.0%
5754.0	22.14	68.9%
5754.2	22.61	70.4%
5755.0	24.50	76.2%
5756.0	27.00	84.0%
5757.0	29.64	92.2%
5757.9	32.14	100.0%

POND B-5 Spillway Crest 5803.9' Dam Crest 5810.4'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5772.0	0.00	0.0%
5773.0	0.00	0.0%
5774.0	0.01	0.0%
5775.0	0.05	0.2%
5776.0	0.12	0.5%
5777.0	0.23	1.0%
5778.0	0.37	1.6%
5779.0	0.54	2.3%
5780.0	0.75	3.3%
5781.0	1.00	4.3%
5782.0	1.29	5.6%
5783.0	1.61	7.0%
5784.0	1.99	8.6%
5785.0	2.42	10.5%
5786.0	2.90	12.5%
5787.0	3.45	14.9%
5788.0	4.05	17.5%
5789.0	4.71	20.4%
5790.0	5.43	23.5%
5791.0	6.21	26.8%
5792.0	7.05	30.5%
5793.0	7.96	34.4%
5794.0	8.96	38.7%
5795.0	10.04	43.4%
5796.0	11.21	48.5%
5796.3	11.59	50.1%
5797.0	12.46	53.9%
5798.0	13.79	59.6%
5799.0	15.19	65.7%
5799.7	16.22	70.1%
5800.0	16.66	72.0%
5801.0	18.21	78.7%
5802.0	19.83	85.7%
5803.0	21.52	93.1%
5803.9	23.12	100.0%

POND C-2 Spillway Crest Elev. 5765.3' Dam Crest Elev. 5775.3'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5745.0	0.00	0.0%
5746.0	0.00	0.0%
5747.0	0.03	0.1%
5748.0	0.13	0.6%
5749.0	0.31	1.4%
5750.0	0.56	2.5%
5751.0	0.91	4.0%
5752.0	1.39	6.1%
5753.0	2.00	8.8%
5754.0	2.77	12.2%
5755.0	3.70	16.3%
5756.0	4.81	21.2%
5757.0	6.09	26.8%
5758.0	7.50	33.1%
5759.0	9.04	39.9%
5760.0	10.73	47.3%
5760.3	11.29	49.8%
5761.0	12.59	55.5%
5762.0	14.62	64.4%
5762.6	15.94	70.2%
5763.0	16.82	74.1%
5764.0	19.19	84.6%
5765.0	21.80	96.1%
5765.3	22.69	100.0%

APPENDIX 8 - CAPACITY CHARTS (continued)

POND A-1		
Spillway Crest Elev. 5829.1		
Dam Crest Elev. 5833.6		
Elevation (Ft)	Volume (MG)	Capacity (%)
5822.0	0.00	0.0%
5823.0	0.00	0.0%
5824.0	0.05	3.8%
5825.0	0.22	16.0%
5826.0	0.45	32.1%
5826.9	0.69	49.7%
5827.0	0.72	51.6%
5827.8	0.97	69.3%
5828.0	1.03	73.7%
5829.0	1.36	97.4%
5829.1	1.40	100.0%

POND B-1		
Spillway Crest Elev. 5882.0		
Dam Crest Elev. 5885.0		
Elevation (Ft)	Volume (MG)	Capacity (%)
5876.0	0.00	0.0%
5877.0	0.00	0.3%
5878.0	0.05	6.1%
5879.0	0.19	22.6%
5880.0	0.38	44.5%
5880.2	0.43	49.6%
5881.0	0.60	70.1%
5882.0	0.86	100.0%

POND A-2		
Drop Structure Elev. 5816.9'		
Spillway Crest Elev. 5820.2'		
Dam Crest Elev. 5823.1'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5798.0	0.00	0.0%
5799.0	0.00	0.0%
5800.0	0.00	0.1%
5801.0	0.01	0.2%
5802.0	0.04	0.6%
5803.0	0.08	1.3%
5804.0	0.16	2.7%
5805.0	0.28	4.7%
5806.0	0.45	7.6%
5807.0	0.67	11.3%
5808.0	0.95	15.9%
5809.0	1.29	21.5%
5810.0	1.68	28.1%
5811.0	2.13	35.5%
5812.0	2.63	43.9%
5812.7	3.02	50.4%
5813.0	3.19	53.2%
5814.0	3.81	63.6%
5814.6	4.22	70.5%
5815.0	4.49	75.0%
5816.0	5.25	87.6%
5816.9	5.99	100.0%
5817.0	6.07	101.4%
5818.0	6.97	116.4%
5819.0	7.94	132.6%
5820.0	8.98	149.9%
5820.2	9.19	153.5%

POND A-3		
Spillway Crest Elev. 5793.0 ft.		
Dam Crest Elev. 5799.0 ft.		
Elevation (Ft)	Volume (MG)	Capacity (%)
5775.0	0.00	0.0%
5776.0	0.01	0.0%
5777.0	0.06	0.5%
5778.0	0.20	1.7%
5779.0	0.42	3.4%
5780.0	0.70	5.7%
5781.0	1.06	8.6%
5782.0	1.51	12.2%
5783.0	2.04	16.5%
5784.0	2.67	21.6%
5785.0	3.39	27.4%
5786.0	4.21	34.0%
5787.0	5.10	41.3%
5788.0	6.08	49.2%
5788.1	6.19	50.0%
5789.0	7.15	57.8%
5790.0	8.31	67.2%
5790.3	8.68	70.2%
5791.0	9.56	77.3%
5792.0	10.91	88.2%
5793.0	12.36	100.0%

APPENDIX 8 - CAPACITY CHARTS (continued)

POND B-2		
Drop Structure Elev. 5868.9'		
Spillway Crest Elev. 5873.0'		
Dam Crest Elev. 5875.5'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5862.0	0.00	0.0%
5863.0	0.02	1.3%
5864.0	0.11	7.6%
5865.0	0.29	19.5%
5866.0	0.54	36.4%
5866.7	0.75	50.5%
5867.0	0.84	56.6%
5867.6	1.03	69.8%
5868.0	1.17	78.6%
5868.9	1.48	100.0%
5869.0	1.52	102.4%
5870.0	1.90	127.9%
5870.7	2.18	147.1%

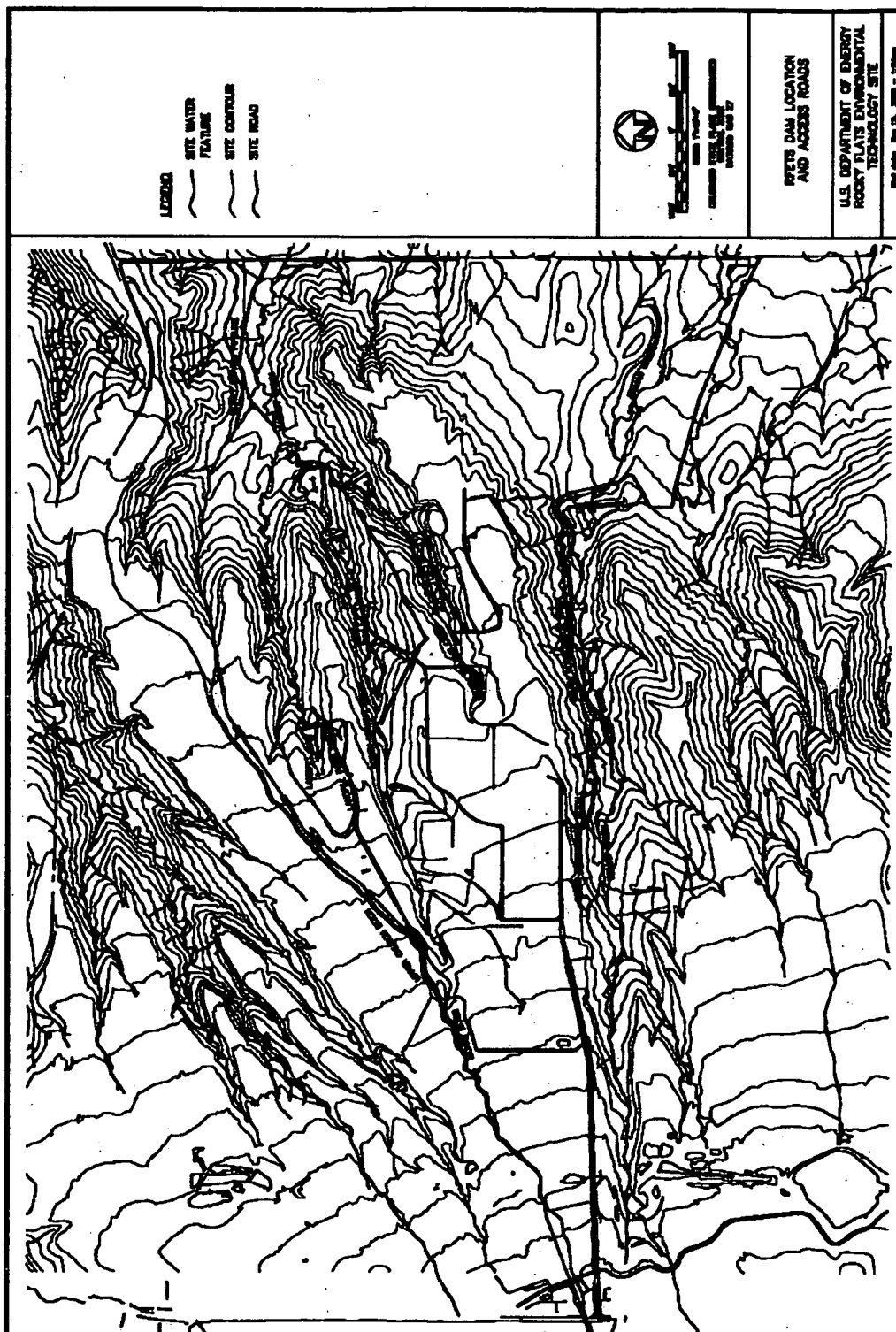
POND B-3		
Riser El 5849.2		
Spillway Crest Elev. 5853.0		
Dam Crest Elev. 5856.8		
Elevation (Ft)	Volume (MG)	Capacity (%)
5846.0	0.00	0.0%
5847.0	0.02	2.3%
5848.0	0.12	12.4%
5849.0	0.25	29.7%
5849.2	0.28	31.4%
5850.0	0.40	42.2%
5850.5	0.48	50.8%
5851.0	0.56	59.3%
5851.6	0.67	70.7%
5852.0	0.74	78.3%
5853.0	0.95	100.0%

LANDFILL POND		
Spillway Crest Elev. 5921.0'		
Dam Crest Elev. 5926.3'		
Elevation (Ft)	Volume (MG)	Capacity (%)
5896.0	0.00	0.0%
5897.0	0.00	0.0%
5898.0	0.33	3.7%
5899.0	0.35	4.0%
5900.0	0.65	7.5%
5901.0	0.71	8.1%
5902.0	0.98	11.2%
5903.0	1.07	12.2%
5904.0	1.30	14.9%
5905.0	1.44	16.5%
5906.0	1.60	18.3%
5907.0	1.79	20.5%
5908.0	2.01	23.0%
5909.0	2.26	25.8%
5910.0	2.53	29.0%
5911.0	2.76	32.5%
5912.0	3.02	35.6%
5913.0	3.33	39.2%
5914.0	3.77	44.4%
5914.7	4.26	50.2%
5915.0	4.52	51.7%
5916.0	5.07	58.0%
5917.0	5.68	64.9%
5917.7	6.14	70.2%
5918.0	6.34	72.5%
5919.0	7.07	80.9%
5920.0	7.87	90.0%
5921.0	8.74	100.0%

POND B-4		
Spillway Crest Elev. 5835.8'		
Dam Crest Elev. 5839.8'		
Flow Through Structure		
Elevation (Ft)	Volume (MG)	Capacity (%)
5832.0	0.00	0.0%
5833.0	0.00	1.8%
5834.0	0.03	16.5%
5835.0	0.09	52.3%
5835.8	0.18	100.0%

POND C-1		
Spillway/Stop Log Elev. 5823.3		
Dam Crest Elev. 5830'		
Flow Through Structure		
Elevation (Ft)	Volume (MG)	Capacity (%)
5819.9	0.00	0.0%
5820.0	0.00	0.0%
5821.0	0.05	9.5%
5822.0	0.24	42.0%
5823.0	0.49	84.7%
5823.3	0.57	100.0%

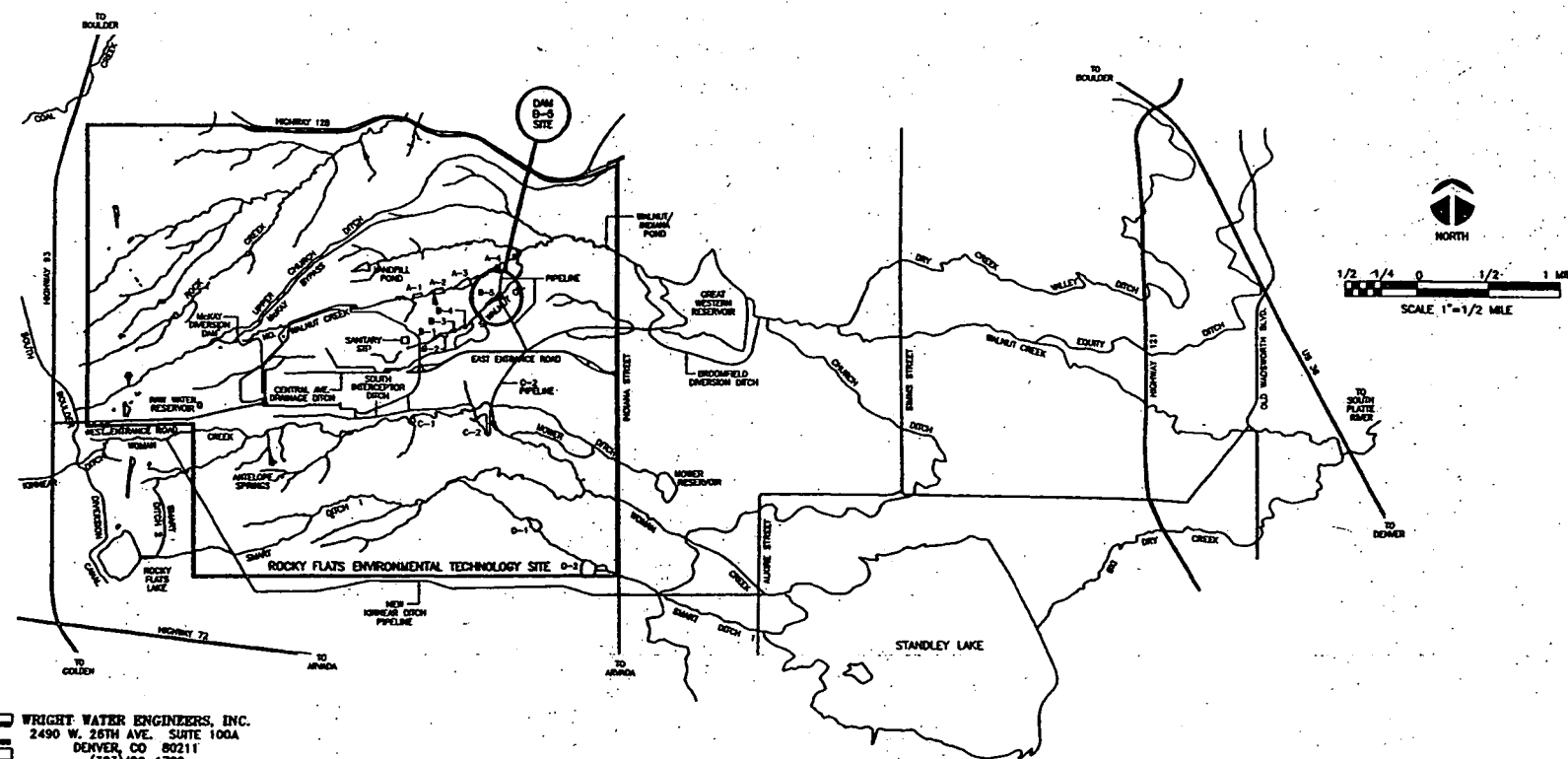
APPENDIX 9 – DAM LOCATION AND ACCESS ROADS



UNITED STATES DEPARTMENT OF ENERGY  
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE  
WATER DIVISION 1, FORMER WATER DISTRICT 2  
B-5 DAM OUTLET MODIFICATIONS

## DRAWING INDEX

DRAWING NO.	DRAWING TITLE
51420-0021	TITLE SHEET AND DRAWING INDEX
51420-0022	SITE MAP AND CONSTRUCTION ACCESS
51420-0023	EXISTING B-5 POND
51420-0024	B-5 DAM SITE PLAN AND DETAILS
51420-0025	OUTLET WORKS PLAN AND PROFILE
51420-0026	INTAKE TOWER MODIFICATION
51420-0027	WATER QUALITY GATE DETAILS
51420-0028	GATE OPERATOR DETAILS
51420-0029	STAFF GAGE DETAILS
51420-0030	OUTLET WORKS TABLES AND CURVES



PART	QUAN	DESCRIPTION	MATERIAL
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**CERTIFICATION**

I hereby certify that these plans for the construction of B-5 Dam Outlet Modifications were prepared under my direct supervision for the owner thereof.

Patricia K. Flood 8/14/97  
Patricia K. Flood, P.E. No. 20307 Date

AS-CONSTRUCTED CERTIFICATION

These plans represent the AS-CONSTRUCTED conditions of the B-5 Dam Outlet Modifications to the best of my knowledge and judgement, based in part on information furnished by others as of the 2<sup>nd</sup> day of March, 1998.


Patricia K Flood 3/9/98  
Date

Approved on the 25 day of August, 1997.

Hal D. Simpson by [Signature]  
State Engineer Deputy #461

State Engineers Office Number: DAMID: 025626

**C-1545B**

<div style="text-align: center;">  <p>AS-BUILTS</p> </div>		2/28/96 PWT TOL 1/12/96 951808
1/8 APPROVED FOR CONSTRUCTION		9/15/97 PWT TOL 1/12/96 951808
A ORIGINAL ISSUE REQUIRES STATE ENGINEERS OTHER SPECIALS FOR CONSTRUCTION		7/23/96 PWT TOL 1/12/96 951808
KEYWORDS	ISSUE	DATE RFP DDF CLASS JOB NO.
1. BARRIER-ZONE	DESCRIPTION	
2. B-S DAM		U.S. DEPARTMENT OF ENERGY ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE GOLDEN, COLORADO
3.	TOLERANCES PLANS & X/Y	DESIGNED 2/9/96 DRAWN 2/9/96 CHECKED 2/9/96 APPROVED 2/9/96
4.	ANGLE & X DEC & BOX	
5.	UNLESS NOTED OTHERWISE	
BARRIER / FACILITY SIZE PWD / HSG PWD COVER / COL. HGT.	REMARKS SHARP EDGES NEXT ASSIGNED	
SCALE: 1"=2.640'		SUBMITTED 7/23/96 SCALE RPT RPT APPROVED DATE
		SIZE DRAWING NUMBER ISSUE SHEET D51420-0021C 1 of 10

OSIZE FORMAT  
REV E APRIL 1964

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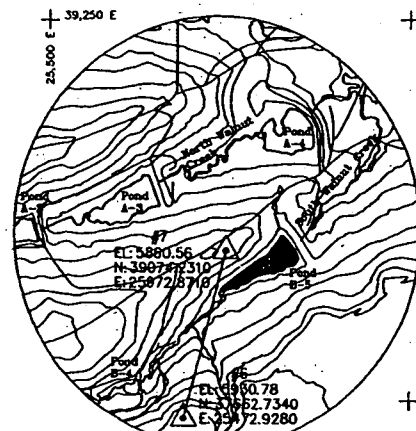
REVISION C & REVISION D HAVE MARKS DUE TO ORIGINAL SIGNATURE

48










ALL UNDERWATER (BELOW 5794) TOPOGRAPHY IS ESTIMATED.  
CONTRACTOR TO VERIFY PRIOR TO CONTRUCTION AS NECESSARY.

ALL UNDERWATER (BELOW 5794) TOPOGRAPHY IS ESTIMATED.  
CONTRACTOR TO VERIFY PRIOR TO CONTRUCTION AS NECESSARY.



**LEGEND**

- |   |                              |
|---|------------------------------|
|    | UTILITY POLE                 |
|    | BURIED VALVE                 |
|    | WELL                         |
| ----  | DIRT ROAD                    |
| -----   | EDGE OF WATER                |
| -----X-----   | BARBED WIRE FENCE            |
| =====   | 1 FOOT CONTOUR (LAND)        |
| =====   | 1 FOOT CONTOUR (BELOW WATER) |
| =====   | 5 FOOT CONTOUR (LAND)        |
| =====   | 5 FOOT CONTOUR (BELOW WATER) |
| -----X-----   | CONSTRUCTION LIMITS          |
|  | CONTROL POINT                |
|  | PIEZOMETER/OBSERVATION WELL  |
|  | INCLINOMETER                 |
|  | DAM MOVEMENT MONUMENT        |

### CONTROL POINT LOCATIONS

SEE ROCKY FLATS PLANT SURVEYOR FOR FIELD LOCATIONS PRIOR TO COMMENCING WORK.

NOTE: DESIGN HEREIN USES DAM DESIGN  
CREST (5810) WITHOUT CAMBER.  
(SEE NOTE 3.)

POND B5

DAM CREST ELEV. 5810.4'  
SPILLWAY CREST ELEV. 5803.9'

50 25 0 50 100 FEET

SCALE 1"=50'

**SHEDS CONSTRUCTION  
FILL WASTE AREA**

~~EXISTING~~

CONSTRUCTION LIMITS

**C-1545B**

**NOTES:**

- NOTES:
1. COORDINATES ARE ROCKY FLATS PLANT COORDINATE SYSTEM.
  2. MAXIMUM RESERVOIR CAPACITY = 73.6 ACRE FEET AT ELEVATION 5803.9.
  3. DESIGN HEREIN USES 1978 DESIGN DRAWINGS, SERIES 27185-100, DAM CREST ELEVATION WITHOUT CAMBER AT ELEVATION 5810.0.
  4. CONSTRUCTION CONTRACTOR SHALL AVOID, OR PROTECT AS NECESSARY, ALL INSTRUMENTATION ALONG THE DAM CREST.



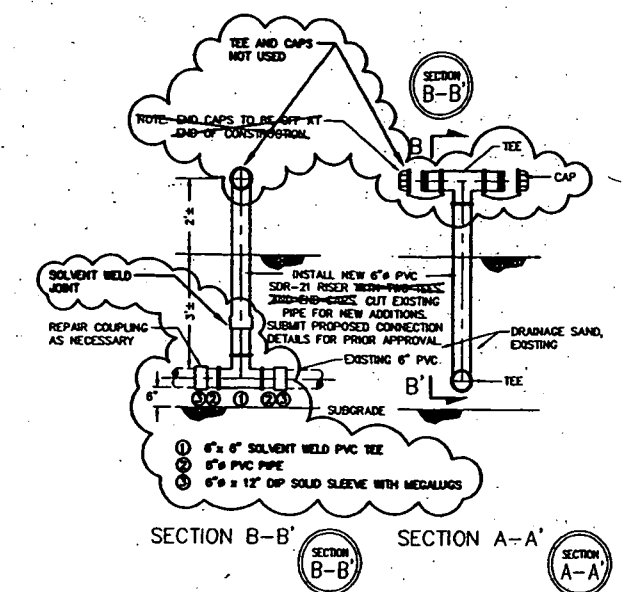
**WRIGHT WATER ENGINEERS, INC.**  
2490 W. 26TH AVE. SUITE 100A  
DENVER, CO 80211  
(303)480-1700

[illegible]DSIZE FORMAT  
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AUTOCAD REL 12 GENERATED  
NO MANUAL CHANGES ALLOWED

ACAD = R\ACD\51420\0023\

PART	QUAN.	DESCRIPTION	MATERIAL
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NOTE: EXISTING DATA PER 1984 PLANS.  
PVC IS 6" DIA. WELL CASING SDR-21.

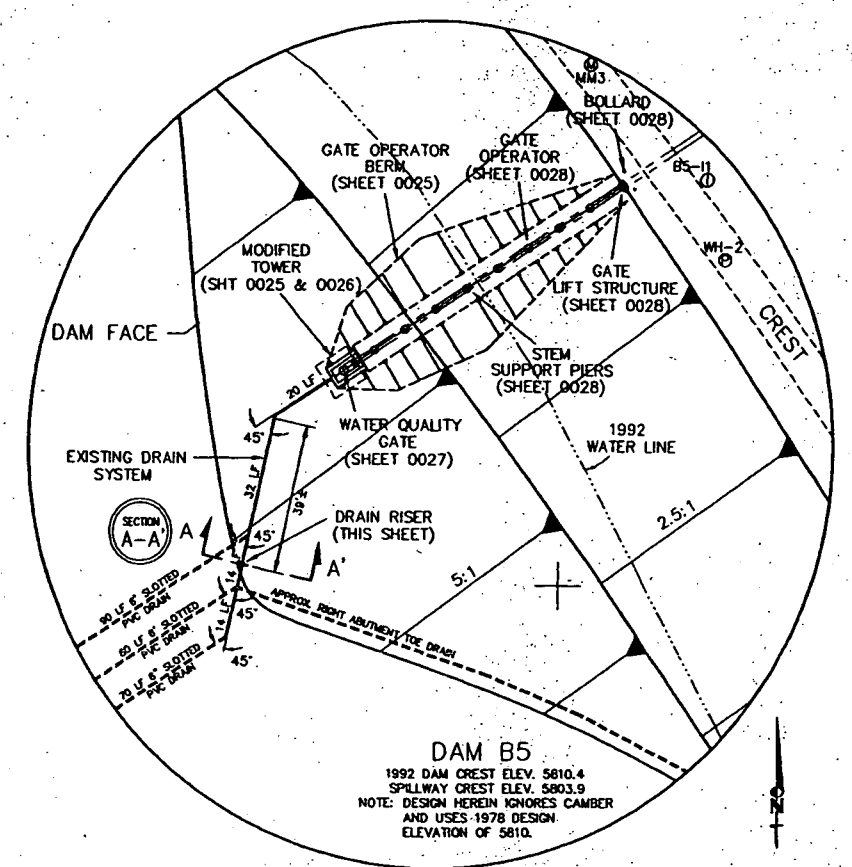
**DRAIN RISER**  
SCALE 1"=2'

**GENERAL NOTES:**

- THESE NOTES APPLY TO ALL SHEETS UNLESS NOTED OTHERWISE:
- 1) CONCRETE TO BE 3000 PSI (28 DAY), 3/4" MAXIMUM AGGREGATE WITH 4 TO 8X ENTRAINED AIR AND FIBERMESH OR EQUIVALENT ADDED PER MANUFACTURERS RECOMMENDATIONS, UNLESS NOTED OTHERWISE.
  - 2) ALL CONCRETE IS TO BE REINFORCED WITH #4 REBAR @ 12" & EACH WAY ON EACH FACE, UNLESS NOTED OTHERWISE. MAINTAIN 3" CLEAR AGAINST EARTH AND 2" CLEAR WHERE EXPOSED TO WEATHER.
  - 3) CONCRETE STRUCTURES SHALL HAVE 3/4" CHAMFER ON ALL EXPOSED CORNERS.
  - 4) THE SUBCONTRACTOR IS RESPONSIBLE FOR PROVIDING AND MAINTAINING A TRAFFICABLE SURFACE SUITABLE FOR THE CONSTRUCTION EQUIPMENT NECESSARY FOR THIS PROJECT WITHIN THE CONSTRUCTION LIMITS.
  - 5) RIPRAP AND BEDDING ARE TO BE REMOVED WHERE NECESSARY FOR STRUCTURES AND WORK AREAS. THE RIPRAP SHALL BE REUSED, SIMILAR TO EXISTING, IN ALL DISTURBED RIPRAP AREAS. EXISTING CONDITIONS ARE 18" THICK RIPRAP LAYER, 12" AVERAGE SIZE ON TOP OF 8" THICK BEDDING LAYER. RIPRAP BEDDING MATERIAL SHALL BE REPORTED.
  - 6) FOR PRIOR AS-BUILT DATA, SEE ORIGINAL 1978 DESIGN DRAWING SERIES 27165-XXX AND 1984 MODIFICATION SERIES 28825-XXX.

**C-1545B**

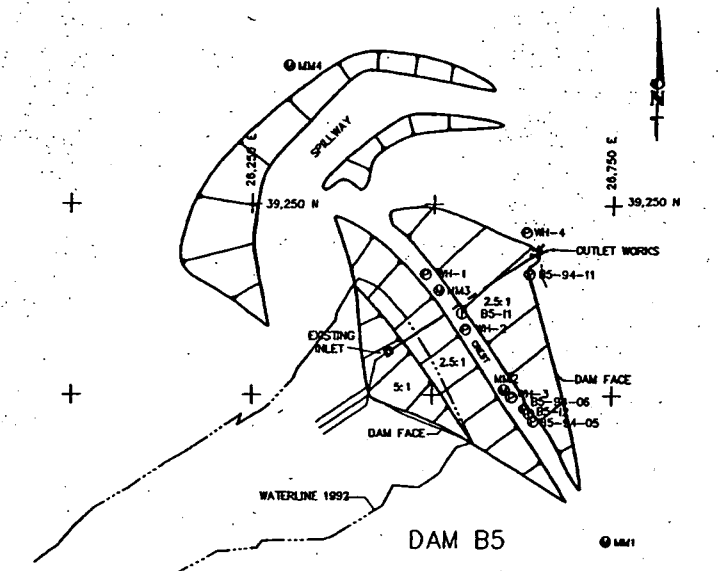
<b>KEYWORDS</b>		AS-BUILT	2/28/96	BY	DATE	DESIGNED	2/9/96
1. BUFFER ZONE		APPROVED FOR CONSTRUCTION	8/15/97	BY	DATE	DESIGNED	2/9/96
2. B-5 DAM		ORIGINAL ISSUE REQUIRED STATE ENGINEERS OFFICE APPROVAL FOR CONSTRUCTION	7/25/96	BY	DATE	DESIGNED	2/9/96
3. BUFFER ZONE		ISSUE	DATE	BY	DATE	DESIGNED	2/9/96
4. BUFFER ZONE		DESIGNED	2/9/96	BY	DATE	DESIGNED	2/9/96
5. BUFFER ZONE		CHECKED	2/9/96	BY	DATE	DESIGNED	2/9/96
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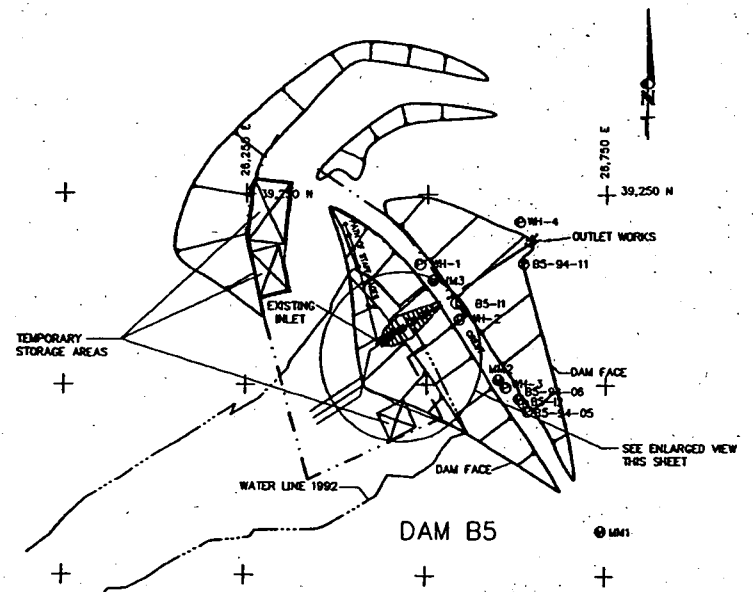
**PROPOSED PLAN - UPSTREAM PORTION**  
**ENLARGED VIEW**  
SCALE 1"=20'

- LEGEND**
- UTILITY POLE
  - BARRED VALVE
  - WELL
  - PERIMETER/OBSERVATION WELL
  - ENCLOSURE
  - DAM MONUMENT MONUMENT
  - DRY ROAD
  - EDGE OF WATER
  - DAMMED RIVER FENCE
  - CHANGED CHANGE FROM SHEET B

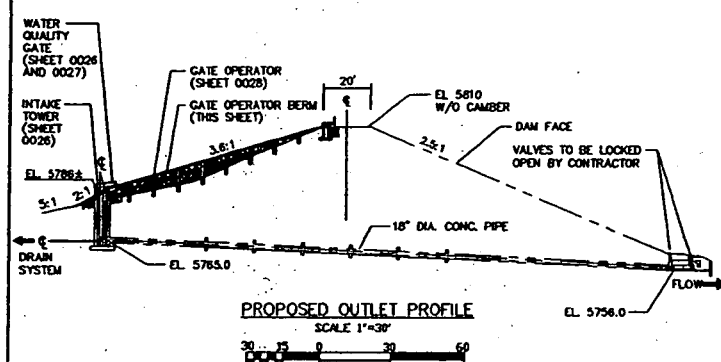
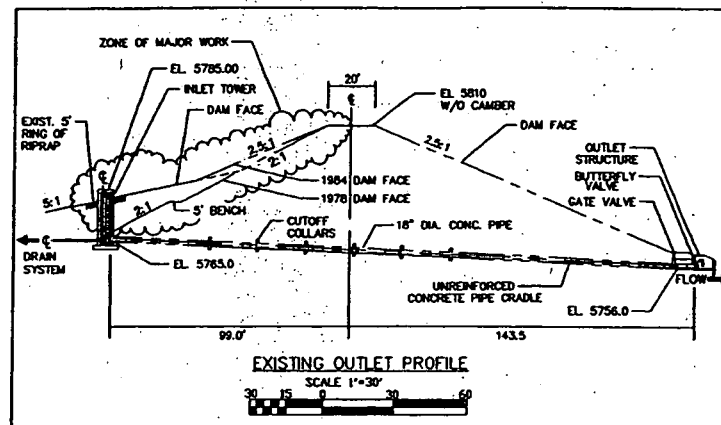
**WWE** WRIGHT WATER ENGINEERS, INC.  
2490 W. 26TH AVE. SUITE 100A  
DENVER, CO 80211  
(303)480-1700



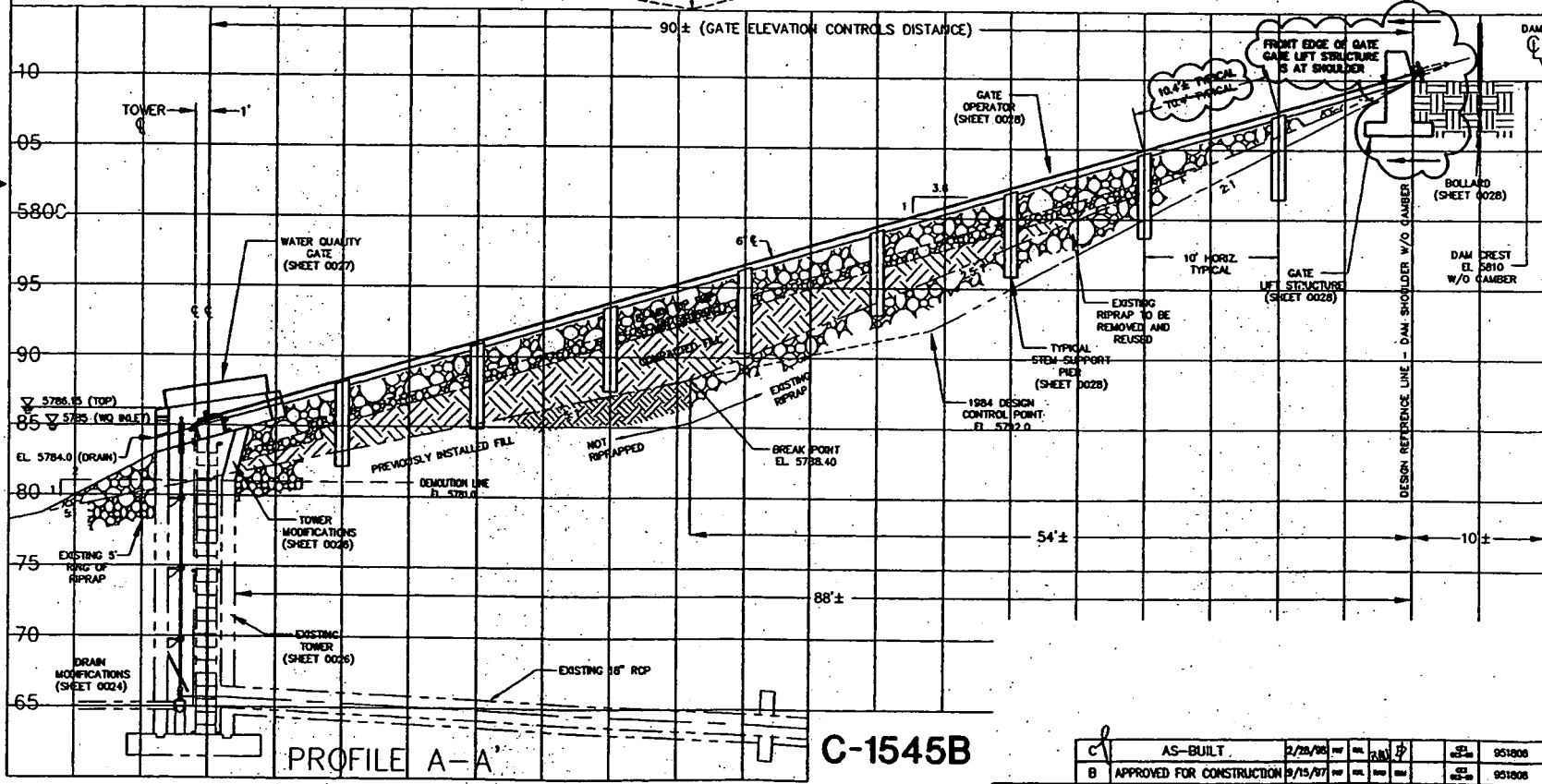
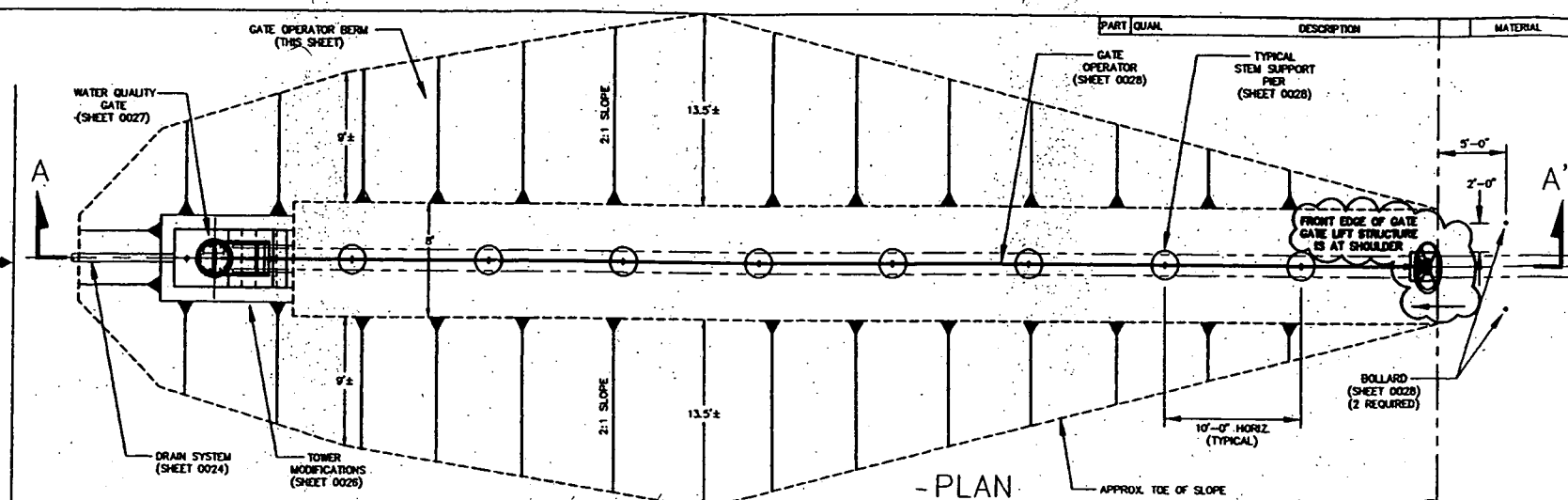
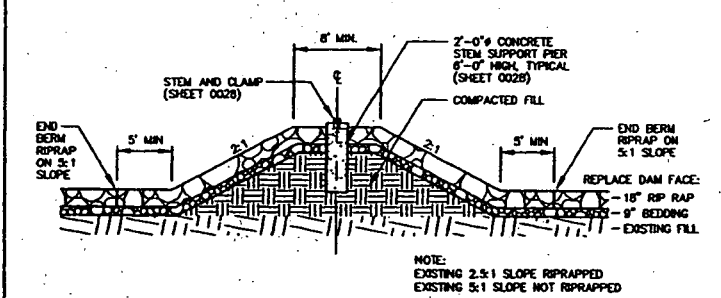
**EXISTING CONDITIONS**  
SCALE 1"=100'



**PROPOSED PLAN**  
SCALE 1"=100'



- NOTES:
- 1) DAM FACE GEOMETRY PER 1978 AND 1984 DESIGN PLANS. CONSTRUCTION SUBCONTRACTOR TO VERIFY PRIOR TO CONSTRUCTION AS NECESSARY. DAM CAMBER IS IGNORED.
  - 2) SEE ROCKY FLATS PLANT SURVEY FOR CONTROL MONUMENT LOCATION DATA.
  - 3) GEOTECHNICAL DATA ON SUBSURFACE CONDITIONS ARE AVAILABLE FROM THE CONTRACTOR, INCLUDING 1978 DESIGN PLANS, FINAL GEOTECHNICAL ANALYSIS FOR DAM UPGRADES (11/94) AND OTHERS.
  - 4) SLICE GATES ARE A POTENTIAL LONG LEADTIME ITEM. THE CONSTRUCTION SUBCONTRACTOR IS RESPONSIBLE FOR EXPEDITING DELIVERY WITH THE SUPPLIER IN ORDER TO ACHIEVE A FOUR WEEK DELIVERY TIME.



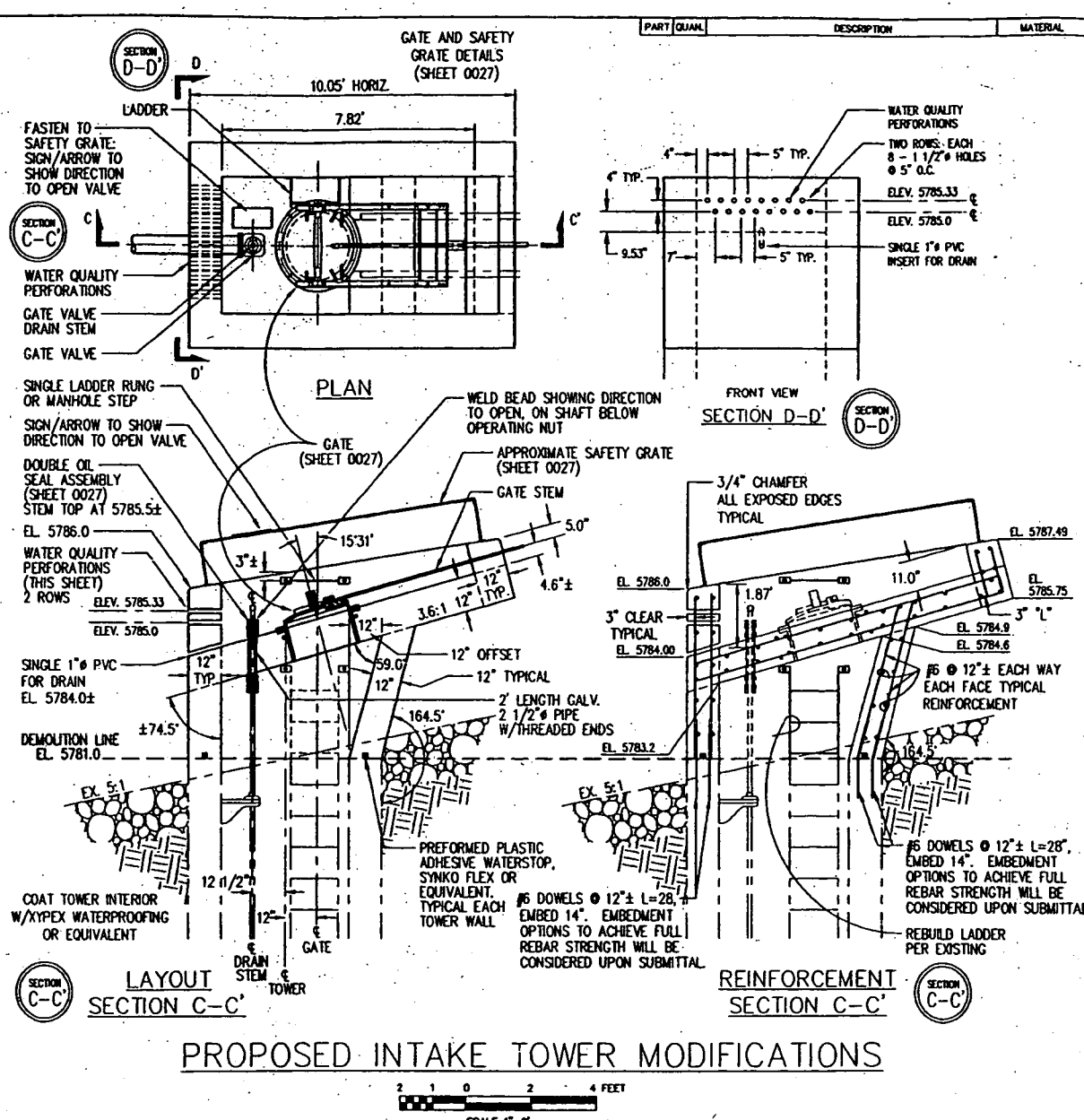
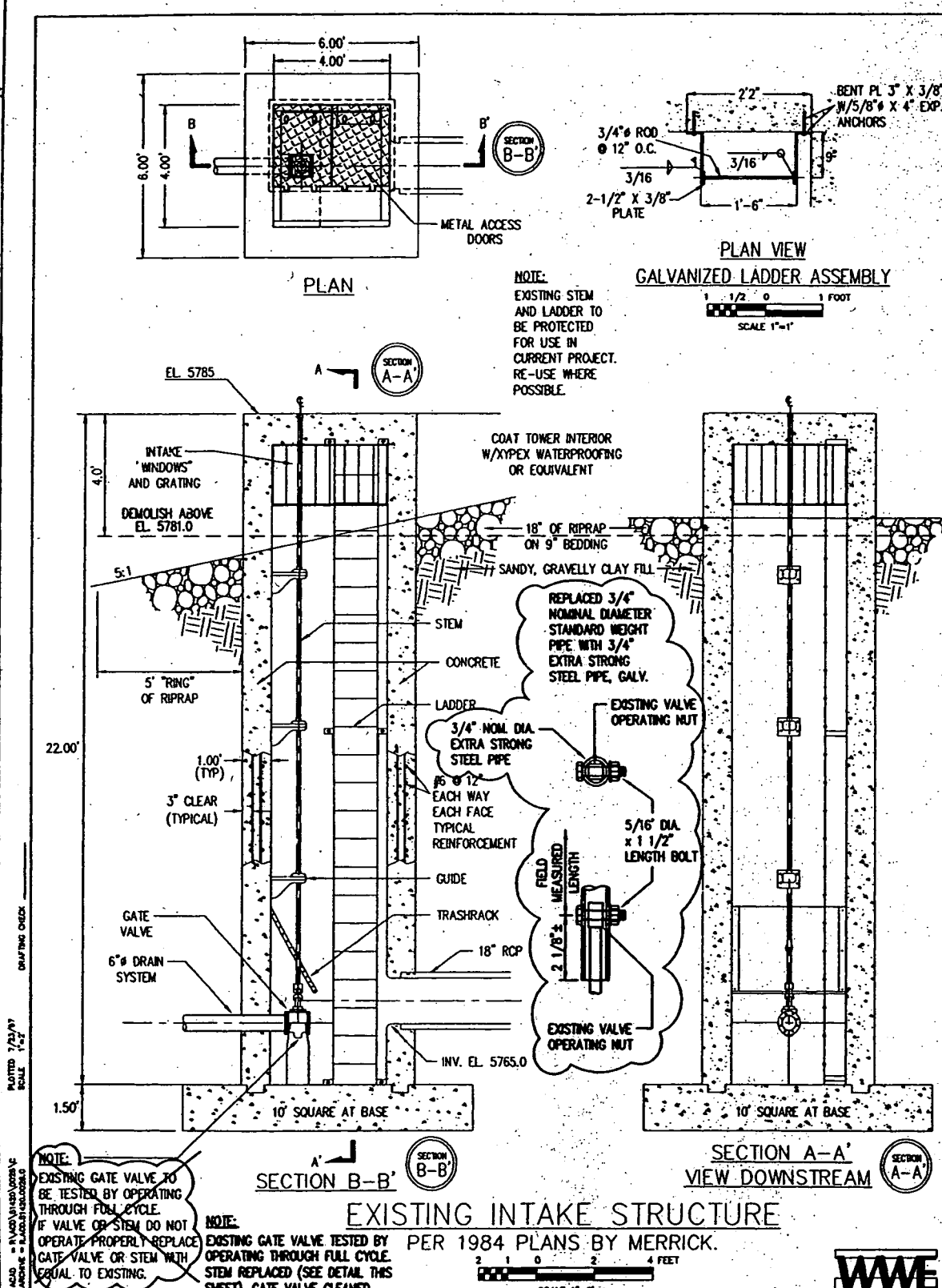
ENLARGED VIEW - PROPOSED  
PLAN AND PROFILE  
SCALE 1"=5'

C-1545B

KEYWORDS		AS-BUILT		APPROVED FOR CONSTRUCTION		DESIGNED		CHECKED		APPROVED		SUBMITTED		SCALE	
1. BUFFER ZONE	2. B-S DAM	3. 4. 5.	6. 7. 8.	9. 10. 11.	12. 13. 14.	15. 16. 17.	18. 19. 20.	21. 22. 23.	24. 25. 26.	27. 28. 29.	30. 31. 32.	33. 34. 35.	36. 37. 38.	39. 40. 41.	42. 43. 44.
U.S. DEPARTMENT OF ENERGY		Rocky Flats Environmental Technology Site		GOLDEN, COLORADO		B-S DAM OUTLET MODIFICATIONS		OUTLET WORKS PLAN AND PROFILE		DRAWING NUMBER		D51420-0025		C 5 of 10	

**WWE** WRIGHT WATER ENGINEERS, INC.  
2490 W. 26TH AVE. SUITE 100A  
DENVER, CO 80211  
(303)480-1700

☁ DENOTES CHANGE FROM ISSUE B



**PROPOSED INTAKE TOWER MODIFICATIONS**

SCALE 1"=2'

C-1545B

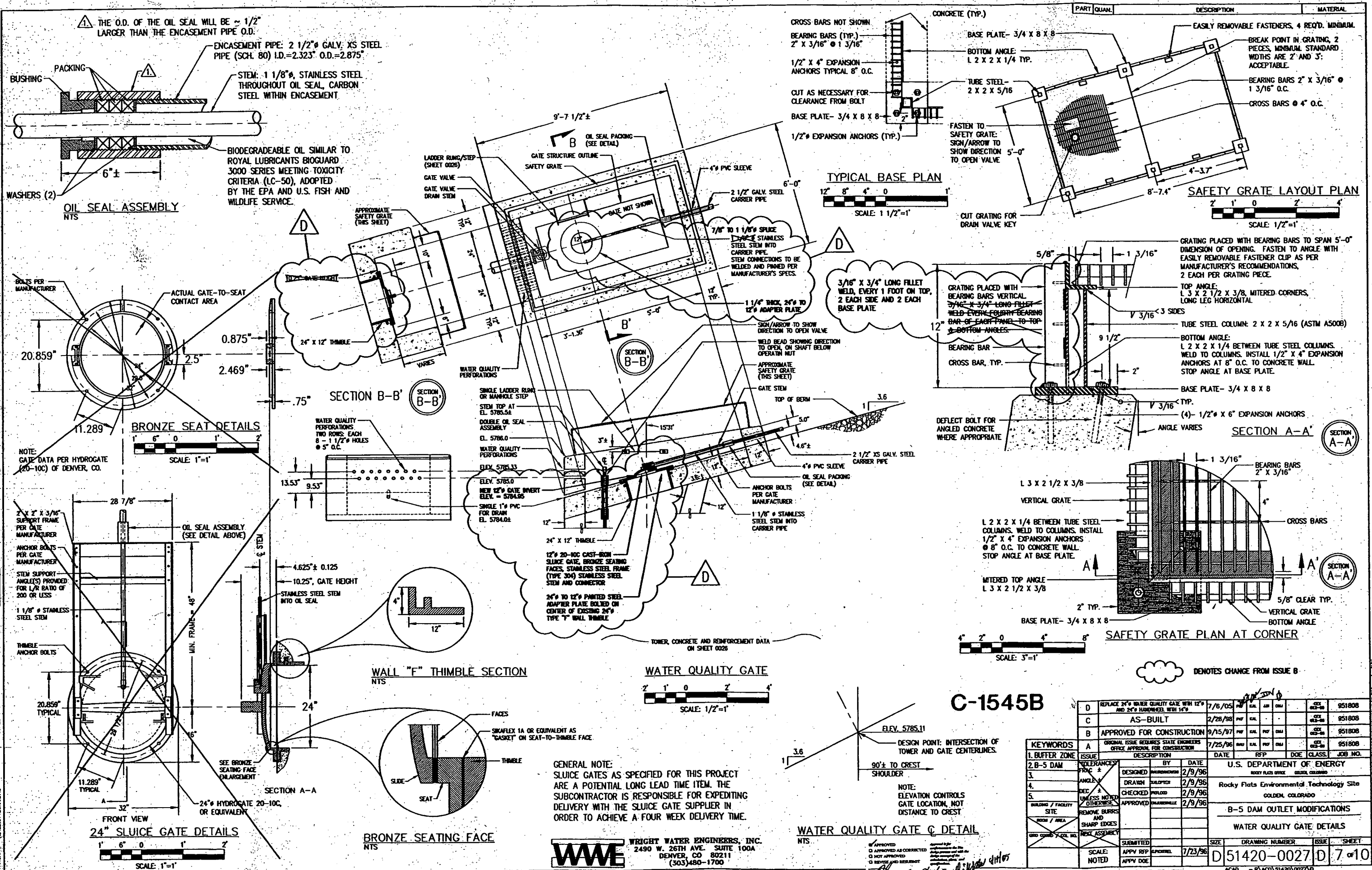
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1. BUFFER ZONE	AS-BUILT		2/25/96	WWE				
2. B-5 DAM	APPROVED FOR CONSTRUCTION		9/15/97	WWE				
3.	DESIGNED		2/9/96	WWE				
4.	DRAWN		2/9/96	WWE				
5.	CHECKED		2/9/96	WWE				
6.	APPROVED		2/9/96	WWE				
7.	REVISION							
8.	REVISION							
9.	REVISION							
10.	REVISION							

U.S. DEPARTMENT OF ENERGY  
Rocky Flats Environmental Technology Site  
GOLDEN, COLORADO

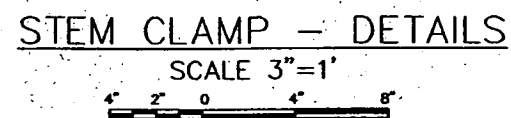
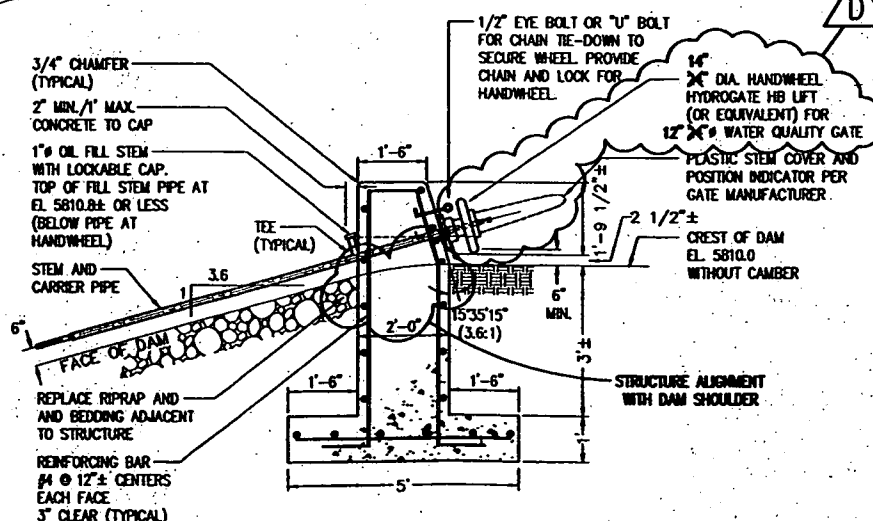
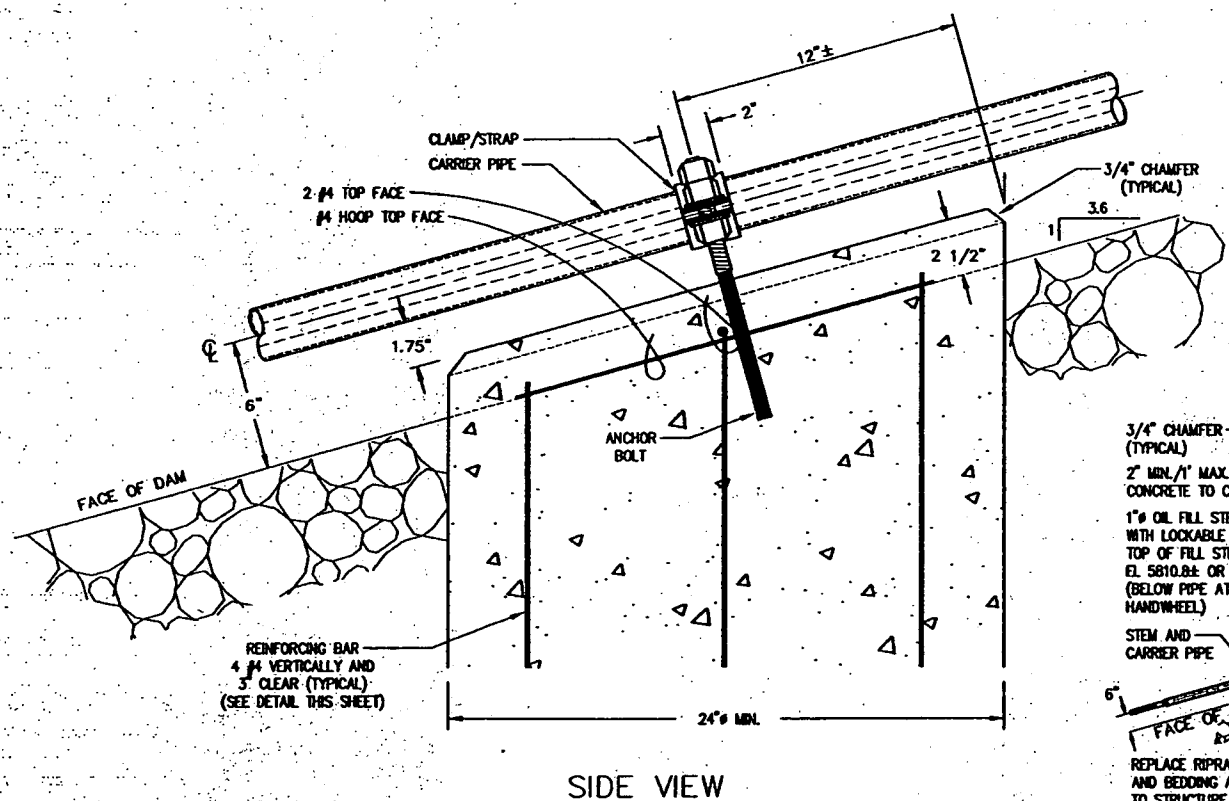
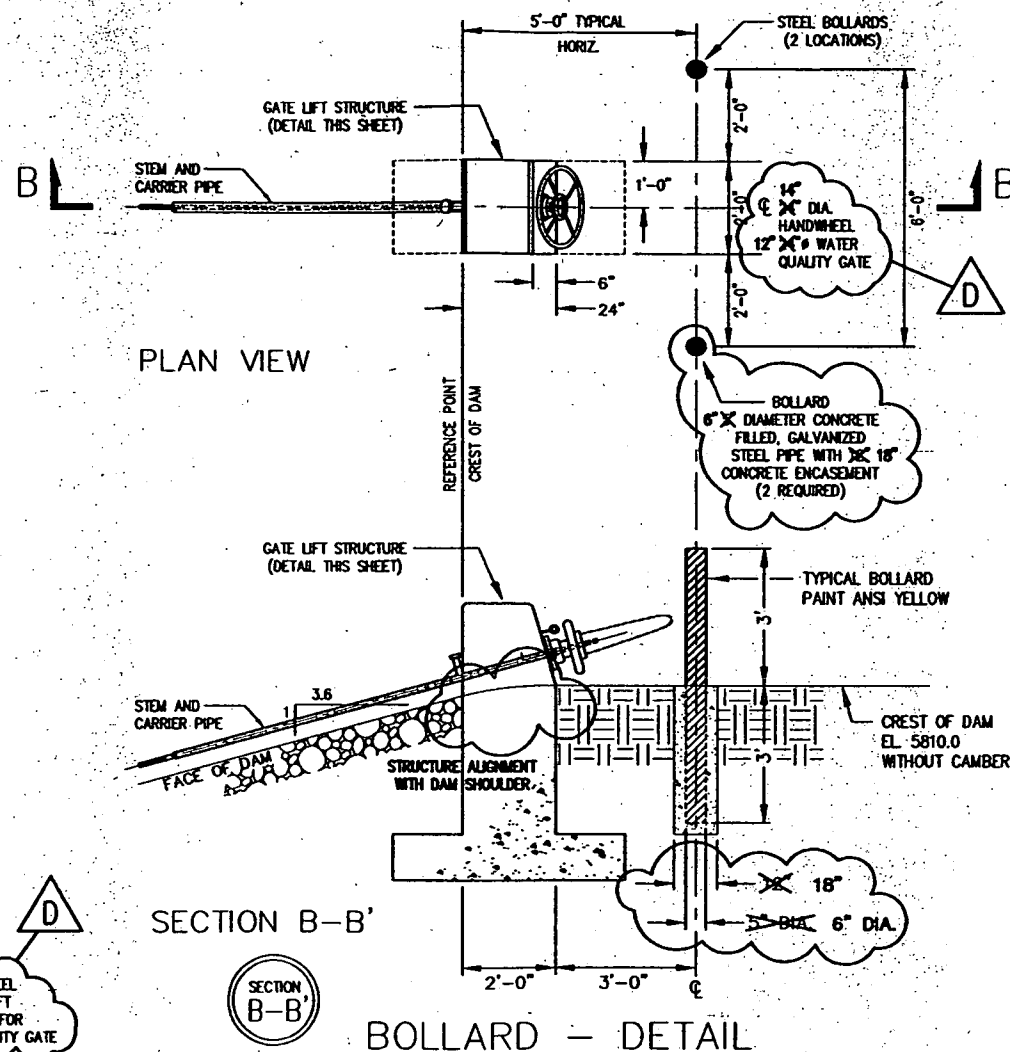
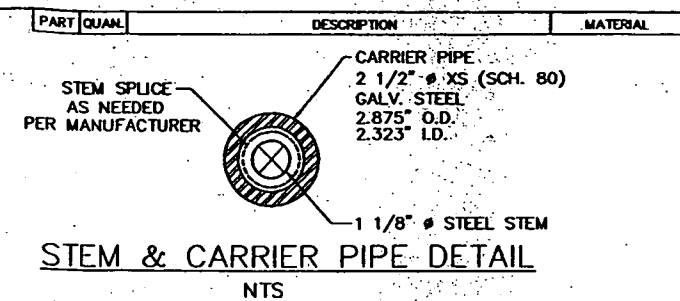
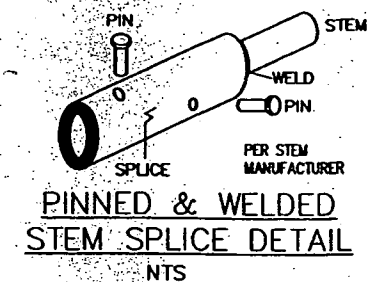
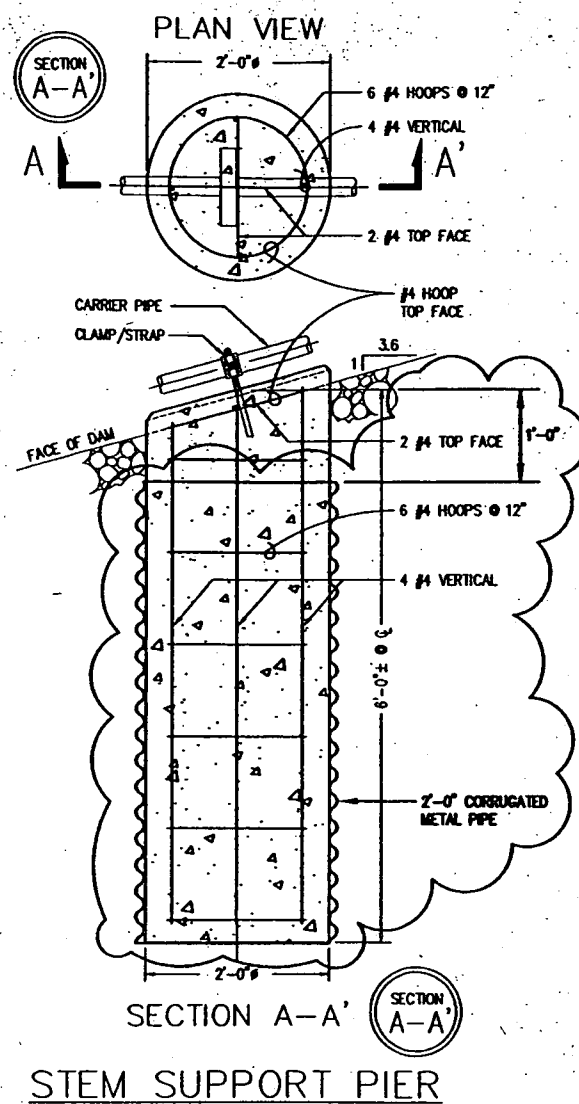
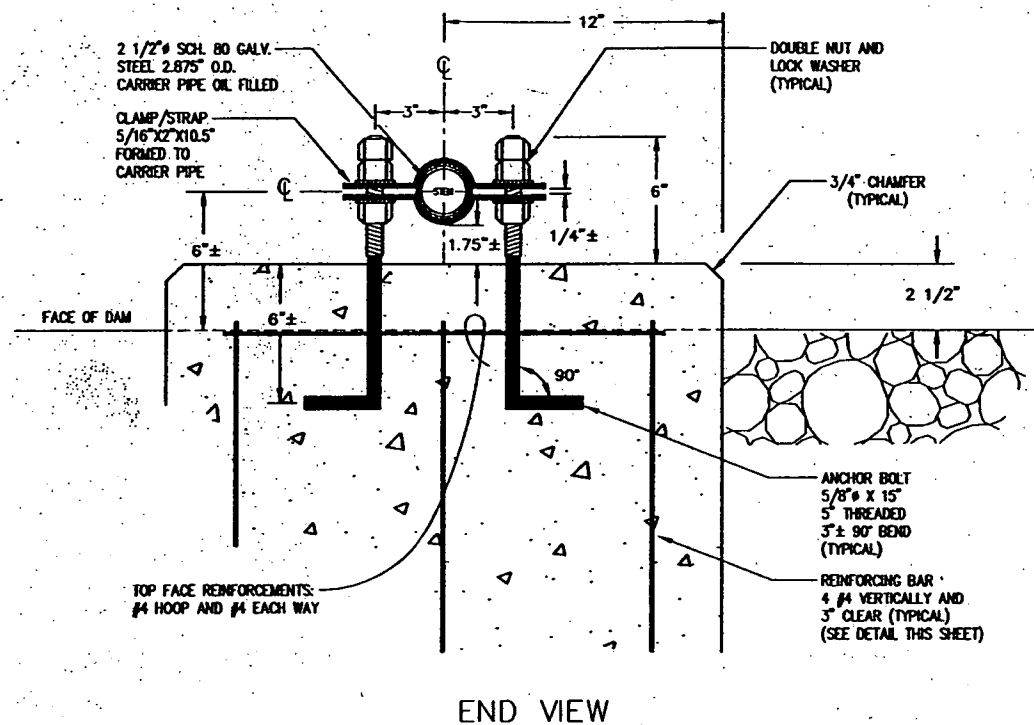
B-5 DAM OUTLET MODIFICATIONS  
INTAKE TOWER MODIFICATION

DRAWING NUMBER: D51420-0026C  
SHEET: 6 OF 10

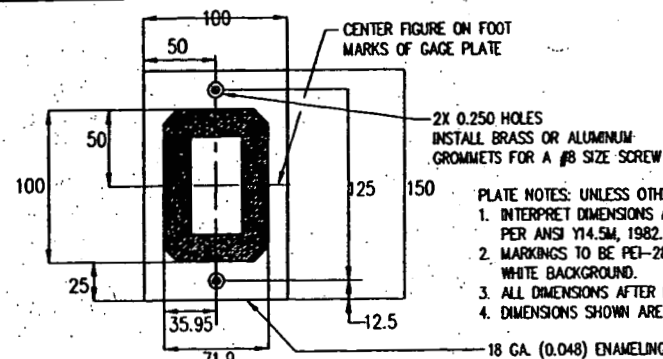
WRIGHT WATER ENGINEERS, INC.  
2490 W. 26TH AVE. SUITE 100A  
DENVER, CO 80211  
(303)480-1700





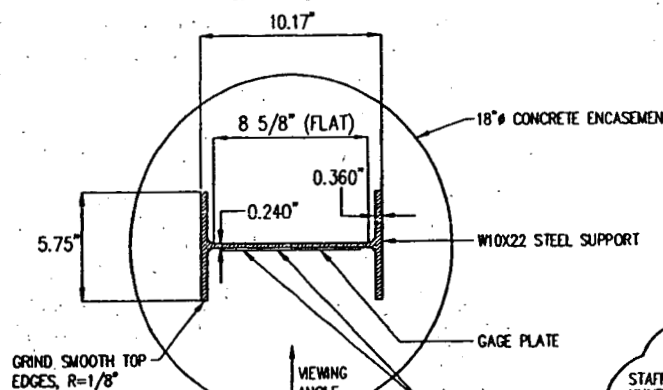


<b>KEYWORDS</b> 1. BUFFER ZONE 2. B-5 DAM 3. 4. 5. BUILDING / FACILITY SITE ROOM / AREA GRID COORD. & ZONE NO.	D	REPLACE 24" WATER QUALITY GATE WITH 24" AND 24" HANDRAILS WITH 14"	8/31/05	REP	COL	AM	DM	COL	951808
	C	AS-BUILT	2/28/98	REP	COL			COL	951808
	B	APPROVED FOR CONSTRUCTION	9/15/97	REP	COL	REP	DM	COL	951808
	A	ORIGINAL ISSUE REQUIRES STATE ENGINEERS OFFICE APPROVAL FOR CONSTRUCTION	7/25/96	REV	COL	REP	DM	COL	951808
	ISSUE	DESCRIPTION	DATE	RFP	DOE	CLASS.	JOB NO.		
	BY	DATE	U.S. DEPARTMENT OF ENERGY ROCKY FLATS OFFICE GOLDEN, COLORADO Rocky Flats Environmental Technology Site GOLDEN, COLORADO B-5 DAM OUTLET MODIFICATIONS GATE OPERATOR DETAILS						
	DESIGNED	2/9/96							
	DRAWN	2/9/96							
	CHECKED	2/9/96							
	APPROVED	2/9/96							
	SCALE: NOTED	7/23/96	D 51420-0028 D 8 or 10						



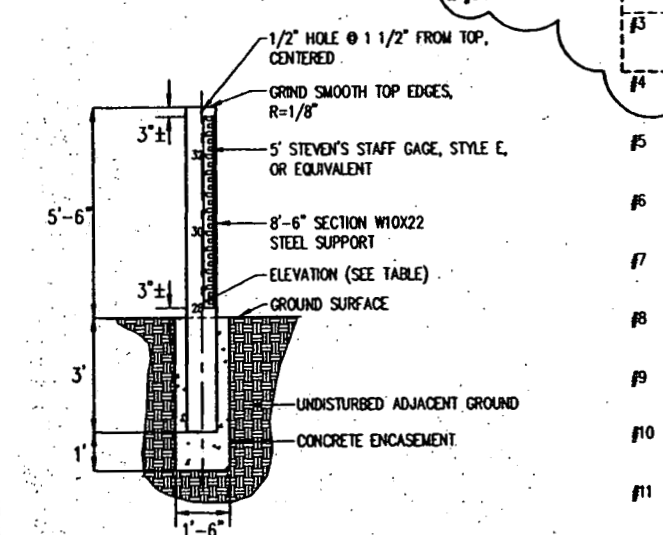
TYPICAL FIGURE PLATE

SCALE: 1"=1'



STAFF GAGE PLAN

SCALE: 3/4"=1'

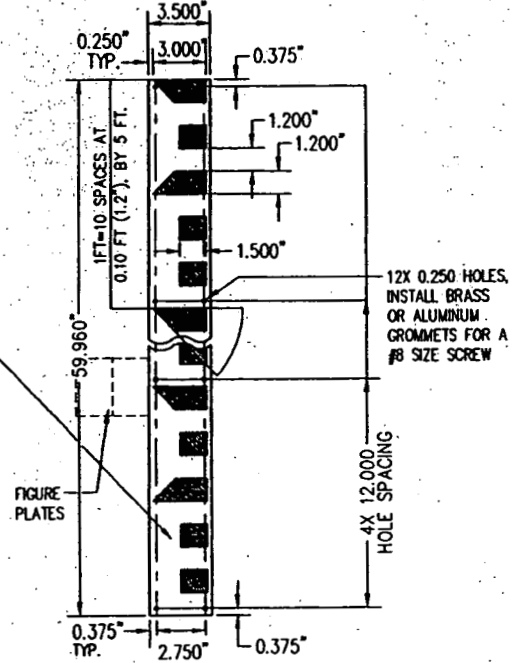


STAFF GAGE ELEVATION - OVERVIEW

FIGURES TABLE

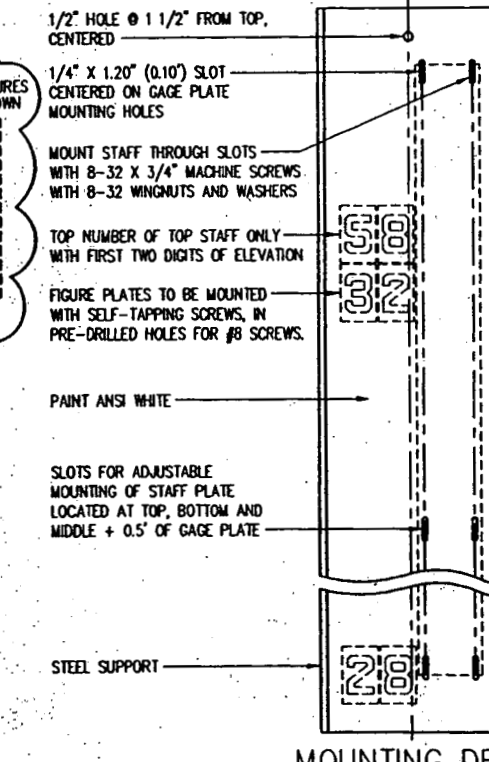
NTS

STAFF NUMBER	STARTING ELEVATION	FIGURES SHOWN
#1	65	66 68 70 72 74 76 78 80 82
#2	69	70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102
#3	73	74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112
#4	77	78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120
#5	81	82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130
#6	85	86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140
#7	89	90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150
#8	93	94 96 98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160
#9	97	98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160 162 164 166 168 170
#10	101	102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160 162 164 166 168 170 172 174 176 178 180
#11	105	106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160 162 164 166 168 170 172 174 176 178 180 182 184 186 188 190



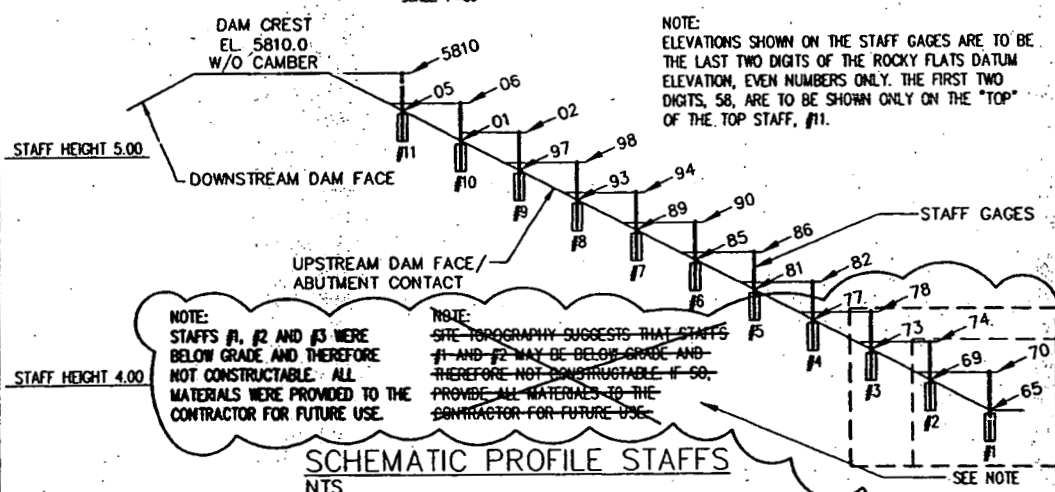
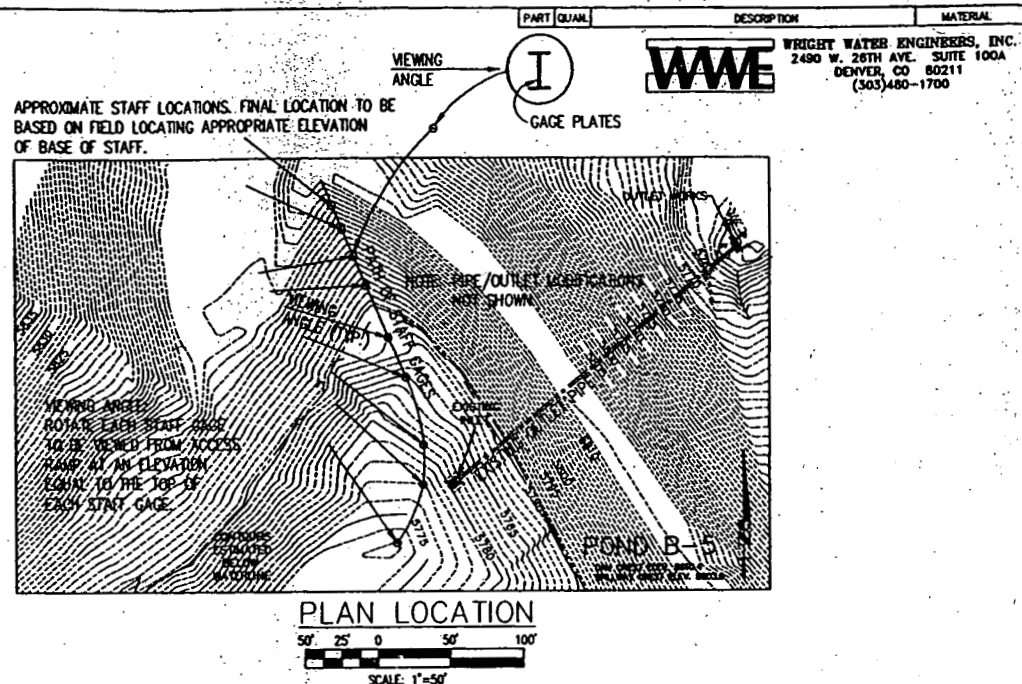
ENAMELED GAGE PLATE

SCALE: 3/4"=1'



MOUNTING DETAIL

SCALE: 3/4"=1'



SCHEMATIC PROFILE STAFFS

NTS

C-1545B

KEYWORDS	AS-BUILT	2/28/96	REV	1	DATE	2/28/96	BY	WWE	DESIGNED	2/9/96	U.S. DEPARTMENT OF ENERGY
1. BUFFER ZONE	APPROVED FOR CONSTRUCTION	6/15/97	REV	2	DATE	6/15/97	BY	WWE	CHECKED	2/9/96	Rocky Flats Environmental Technology Site
2. B-5 DAM	ORIGINAL ISSUE REQUIRES STATE ENGINEER'S OFFICE APPROVAL FOR CONSTRUCTION	7/25/96	REV	3	DATE	7/25/96	BY	WWE	APPROVED	2/9/96	Rocky Flats Environmental Technology Site
3. ANGLE											Rocky Flats Environmental Technology Site
4. SEE											Rocky Flats Environmental Technology Site
5. UNLESS NOTED OTHERWISE											Rocky Flats Environmental Technology Site
6. REMOVE BLURBS AND SHARP EDGES											Rocky Flats Environmental Technology Site
7. NEW CONCRETE FILL IN											Rocky Flats Environmental Technology Site
8. SCALE: NOTED											Rocky Flats Environmental Technology Site
9. APPLY RFP											Rocky Flats Environmental Technology Site
10. APPLY DOE											Rocky Flats Environmental Technology Site

OSIZE FORMAT  
REV E APRIL 1995

AUTOCAD REL 12 GENERATED  
NO MANUAL CHANGES REQUIRED

ACAD - B-5 DAM OUTLET MODIFICATIONS  
ARCHIVE - B-5 DAM OUTLET MODIFICATIONS

REVISIONS  
DATE  
BY  
REASON  
1. 2/28/96  
2. 6/15/97  
3. 7/25/96

